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ABSTRACT

The four articles in this volume address themselves to issues in the teaching of English for science and technology (EST). H.G. Widdowson, in "EST in Theory and Practice," argues that teaching that is not informed by a functional approach to language can oversimplify pedagogical problems. "Designing English for Science and Technology (EST) Programmes," by Keith Jones and Peter Roe, places the problems in designing EST programs within the context of broad educational development consideration. J.R. Ewer, in "Teaching English for Science and Technology: The Specialised Training of Teachers and Programme Organisers," urges the recognition of teacher education in EST as the key priority in the short and medium term. Finally, "Developing Study Skills in English," by Christopher N. Candlin, J. Michael Kirkwood, and Helen M. Moore, examines the historical and theoretical background relevant to the problems of developing study skills in English. (JB)

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English for Academic Study

with special reference to Science and Technology

Problems and Perspectives

An ETIC Occasional Paper

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CONTENTS

	Page Reference
Preface	1 – 2
EST in Theory and Practice *(H G Widdowson)*	3 – 10
Designing English for Science and Technology (EST) Programmes *(Keith Jones and Peter Roe)*	11 – 42
Teaching English for Science and Technology: the specialised training of teachers and programme organisers *(J R Ewer)*	43 – 49
Developing Study Skills in English *(Christopher N Candlin, J Michael Kirkwood and Helen M Moore)*	50 – 69

PREFACE

A major, if not the crucial, issue in education is the accessibility of knowledge. This is what underlines curriculum planning, syllabus statement, teacher education and the provision of resources. It is only recently that the role of language as the medium for expounding and exploring the knowledge that is fed into education systems has been given the attention it deserves. Language together with diagrams and mathematics makes up the sign systems that display the content of subject disciplines in texts and allow the student to explore that content. Clearly the efficiency of any learning operation will depend on the mastery of both the sign systems that are used and the content they convey and the degree to which they are integrated in learning programmes. It is to this basic educational need against the background of the information explosion on one hand and the expansion of education systems on the other that this collection of papers addresses itself. The papers are concerned with the role that English is being called upon to play in the education of scientists and technologists at sixth-form and university levels for overseas students both as their main study language and as an additional study language.

The collection is thus a contribution to the growing field of English for Specific Purposes. Before comment on it is made, it may be as well to establish some terminological distinctions. ETIC makes a distinction between English for Academic Purposes (EAP) and English for Occupational Purposes (EOP) as the two main branches of English for Specific Purposes (ESP). EAP is concerned with those communication skills in English which are required for study purposes in formal education systems. It is curriculum-oriented, and in areas such as Anglophone Africa where English is the **main** study language it involves primary and secondary as well as tertiary levels. The key area within EAP is perhaps English for Science and Technology (EST). EOP is concerned with the precise demands that specific occupations (in commerce, medicine, technology, etc) place upon communicative ability in English. It is activity-oriented and more narrowly focussed than EAP, although its range may vary from a technician consulting an instruction manual or a waiter in a tourist hotel to a doctor in casualty or the conduct of a large business. The major overlap between EAP and EOP lies in those educational areas (eg technical colleges) which are highly vocational.

What we have **not** attempted to do in commissioning and contributing to this collection is to attempt a state-of-the-art survey. The main aim of these papers is to do some very necessary ground-clearing in terms both of the educational problems involved and of the theoretical and organisational perspectives that seem useful, promising and, in some cases, essential. Contributors were asked to provide position papers rather than consensus statements. The hope was that a collection of different perspectives would stimulate those actively engaged in the field and provide a useful map of problems for those about to be involved. It will be some time before ESP hardens into any kind of orthodoxy, and it seems as well to recognise some of the differing interpretations that currently exist.

Henry Widdowson's paper 'EST in Theory and Practice' opens the collection of papers with the argument that while research can over-complicate the issues involved, practice that is not informed by the need to look at language functionally can over-simplify the problems. Widdowson, together with an Edinburgh colleague, J P B Allen, is currently editing and contributing to an important set of materials for EST under the title **English in Focus** (OUP), and it is from the perspectives of material preparation as well as theoretical exploration of the relation between language and pedagogic science and technology that he presents this argument.

The joint paper by the editors of this collection, Jones and Roe, tries to place the problems in designing EST programmes within a broad context of educational development. Both educational policy and institutional practice are considered and a crude procedural model involving an interpretation of needs, ends and means is advanced. The basic thesis is that the problems are not linguistic but curriculum problems and require not only an understanding of how knowledge is mapped by rhetoric into grammar, an understanding that can only evolve from operational research, but a concerted attack on the problem by curriculum as well as applied linguistics practitioners. The paper, much of it frankly speculative, argues for urgent long-term undertakings as well as immediate action.

Jack Ewer's paper is a plea for the urgent recognition of teacher education in EST as the key priority in the short and medium term. Traditional teacher-training procedures are seen as inadequate for the special tasks facing EST teachers. The difficulties facing the EFL/ESL teacher who turns to the teaching of EST are usefully detailed in five categories – attitudinal, conceptual, linguistic, methodological and

organisational – and Ewer's experience in Chile, an experience dating back to the 1950's, is then drawn on to point the way ahead.

The joint paper by Candlin, Moore and Kirkwood, drawing on their experience in designing courses in study skills for overseas postgraduates coming to Britain, examines the historical and theoretical background they see as relevant to the problems of developing study skills in English. The bulk of the paper has to do with Study Skills Analysis and Course Design and with samples of materials they have devised. It ends with a critical examination of their current efforts that focusses on such problems as integrating a remedial grammar component and developing a closer relationship between linguistic skills and thinking.

The papers thus range widely over theory, practice and operational needs and should prove of interest to those involved in EST policy and practice at a variety of levels.

ETIC April 1975

EST IN THEORY AND PRACTICE

H G Widdowson

Over the past few years two developments have been apparent in the methodology of English teaching. One of these has been an increased concern with the problems of learners in further and higher education who need to know the language to pursue their specialist studies, in particular in the fields of science and technology. The second has been the recognition, provoked by recent work in sociolinguistics and philosophy, that the ability to use the language as a means of communication does not follow as a necessary consequence of learning the language as a formal system but has to be developed by teaching in some way. One development has extended from ELT to ESP/EST and the other has extended from linguistic structures to communicative activities. The developments are not, of course, unconnected. When English is taught in the context of general primary and secondary education, there is no immediate means of checking on the assumption that communicative abilities will naturally emerge from a knowledge of the language system when the need arises. Aims are defined internally by reference to examination requirements. When aims are defined externally by reference to specific purposes, however, as they are in ESP/EST, an immediate return on teaching investment is expected in the form of effective communicative ability. A concern with ESP/EST necessarily entails a concern with communicative competence.

I do not think that it will be seriously disputed that there is a need to devise teaching programmes which will develop the communicative ability to handle scientific and technical discourse in English. The question at issue is how we might set about doing it, and in this paper I want to explore this question and try to make clear in my own mind what problems are involved. The exploration will be tentative because I am uncertain of the ground and there are no reliable maps to guide us. I shall be feeling my way.

I will begin with a general observation and then explore its implications in detail. It seems to me that there are currently two ways of thinking about EST. One of them would appear to take the view that we already have the means of devising EST programmes and that our problems are essentially operational ones within the scope of pedagogy, involving the appropriate application of what we already know. On the other hand there is an opposing school of thought which takes the view that we have very little to apply, that we know little or nothing about the nature of scientific and technical communication, and that the design of effective teaching programmes depends on the findings of research which has yet to be undertaken. In this view, the problems are essentially theoretical and come within the compass of linguistics broadly defined. My own feeling is that the first school of thought over-simplifies the situation and that the second over complicates it. In this paper I should like to try to give substance to this feeling and thereby to work my way towards a formulation of what I see to be the principal problems in EST. In doing so I shall be trying to reconcile the operational and theoretical views, to mediate between pedagogy and linguistic theory in a broad sense. This paper is intended, therefore, as an exercise in applied linguistics.

I think that those who take the operational view believe that scientific and technical English can be characterised and taught as a register or group of related registers defined in terms of formal linguistic properties. To devise an EST programme, therefore, one would proceed in the following way: conduct a statistical survey on a sample of English of the kind one wishes to teach and establish the relative frequency of occurrence of the lexical and syntactic units in it, then devise language teaching materials which will give relative weighting to these linguistic elements in accordance with their importance as measured by frequency. This, of course, is one of the basic procedures employed for selection in structural syllabuses of the conventional kind. In this view, EST simply involves the application of an already existing approach to a more restricted sample of language data. Presentation as well as preparation procedures are also conceived in conventional terms and in a good deal of existing EST material we find structural exercises and comprehension questions which only differ from those in general ELT material by being associated with language data which is scientific and technical in referential content.

I have expressed elsewhere my doubts about the efficacy of the structural approach in general and about its appropriateness for the teaching of science and technology in particular[1]. Perhaps I might briefly summarise my position here. A register analysis, as generally understood and practised, takes samples of actual discourse and breaks them down into their constituent linguistic elements. What counts as a linguistic element for the purpose of the analysis will be determined by the model of description being used and the largely ad hoc decision as to which elements are likely to be easiest to recognise and count and which are likely to yield a significant characterisation of the sample. A taxonomic model, for example, will reveal no deep structure elements; inter-sentential relations involving cross-reference might

be significant but difficult to recognise and count; certain forms (on, by, to, for example) would be easy to recognise and count but carry little information in isolation from the syntactic environments which indicate their functional significance. But quite apart from these design faults there is the more radical question of the nature of the information that emerges from this kind of formal analysis. What we get is a quantitative statement about the frequency and the types of those linguistic elements which are specified in the model of analysis. Since the analysis isolates these from context it cannot indicate how they function in relation to each other in the discourse as a whole. It may reveal the relative frequency of tokens of certain clause types, for example, but it cannot indicate any variability in their communicative value; it may reveal a high incidence of passive verb forms but it cannot indicate the different kinds of statement which these forms are used to make. In brief, a register analysis which atomises discourse into linguistic elements characterises a sample of language quantitatively as a manifestation of the language system. What it does not do is to show how the language system is realised qualitatively in particular instances as communicative activity. It accounts for samples of language as instances of linguistic usage but not as instances of communicative use.

It is of course precisely the manifestation of the language system as usage which the structural approach as commonly practised in general ELT is primarily designed to teach. Thus the operational view which sees the problem of EST as having to do with the application of the findings of register analyses in effect does not recognise the connection between the two developments which I mentioned in the introductory paragraph. The transition from ELT to EST does not correspond with a transition from linguistic forms to communicative functions: the assumption is still that once the usage characteristic of scientific and technical English is learned then students will automatically know how the language is put to use in those communicative activities which characterise science and technology as fields of enquiry. I do not believe that this is so and it is for this reason that I think that the school of thought that holds such a view over-simplifies the situation. I do not believe that a knowledge of how English is used in scientific and technical communication can arise as a natural consequence from the learning of the sentence patterns and vocabulary which are manifested most frequently in samples of communication of this kind. We need to set up conditions which will lead students to make the transition from usage to use.

But if EST is to be concerned with the teaching of use where can we find descriptions of use upon which teaching programmes can be based? The short answer is: nowhere. At this point we come to the second school of thought. The view here might be expressed as follows: EST must be centrally concerned with developing the ability to process scientific and technical communication. This involves a recognition of how the concepts and procedures of science and technology are expressed through communicative acts which are related in an intricate way to form structured discourse and how this complex structure of acts is realised through the particular medium of English. In brief, the effective design of EST programmes is thought to depend on descriptions of use based on a comprehensive model of discourse. Whereas the operational view represents the task of teaching EST as straightforward and within the competence of the practising teacher, this view represents it as enormously complex: a matter for research in an area of inter-disciplinary enquiry which at present is the scene of a great deal of busy activity in the form of tentative exploration with everybody staking claims but where nothing is known with any certainty. A pioneer's delight but a nightmare for anyone with a liking for law and order.

It might be edifying to consider briefly the kind of difficulties which have arisen in this field of research. So long as the systematic (or in the dialects of most linguists, scientific) study of language operates at a level of idealisation which excludes variation and context, it is possible to specify the properties of a language in terms of well-defined linguistic units. But once this idealisation is relaxed to allow consideration of the fact that people use language to communicate with each other in social settings, the ordered arrangement of this neat conceptual universe begins to disintegrate. Philosophers in their speculative way talk about speech acts, and the linguists, naturally inclined to value speculation, feel compelled to take note of how sentences are used in the performance of such acts. In consequence, certain basic distinctions lose their clarity. The classic dichotomies upon which so much of modern linguistics depends: langue/parole, competence/performance, sentence/utterance, semantics/pragmatics, are called into question. At the same time, the linguistic order is being undermined from another quarter: those scholars who adopt a sociological perspective on the study of language point to the regularity of variation and its significance in accounting for social meaning. They show how the systematic study of actual language data can reveal system, that by widening the scope of linguistic enquiry one can establish regularity without having to postulate homogeneity, that system can be dynamic and variable and does not have to be static and well-defined.

It should not be supposed that the current uncertainty in linguistics betokens a decline. Theoretical principles must, like everything else, be subject to change. All systematic enquiry must be based on idealisation of one sort or another, and idealisation of one sort provides the opportunity of developing insights which are different from those which idealisation of another sort might allow. The fact that linguistics is currently undergoing a reappraisal of its principles and a realignment of its theoretical position should not make us forget the immensely important advances which were made under the formalist, and more particularly, the transformational-generative regime. On the other hand it should make us aware of two points which are of relevance to our discussion of EST.

The first relates to the operational school of thought which I spoke about earlier. It is this: there is no model of linguistic description that has a patent on the truth and so there is no model of linguistic description which should command complete allegiance. The language teacher necessarily looks to the linguist for guidance, and it is obviously tempting to seek security in one view of language rather than to range restlessly over several. But it seems to me that the second alternative is the one that is to be preferred. The language teacher should be adept at drawing insights from a wide spectrum of enquiry and exploiting them for his own purposes in order to arrive at a synthesis based on pedagogic principles. Only if he has this flexibility will he be able to adjust to the kind of teaching needs which EST, for example, brings to light by taking new developments in linguistic thinking into account. As I have already suggested, the operational view is inadequate because it adheres too closely to a particular model of description.

The second point that arises in connection with the current state of linguistics relates to what I have called the theoretical view of EST. The problem here is that those who espouse it are in a sense too much involved in recent developments. Whereas the first view is not sufficiently informed by theory, the second is not sufficiently informed by practice. Let us consider this view more closely. In standard generative theory there is an assumption that the underlying cognitive processes which inform language behaviour can be captured by a set of algebraic rules: an equation is set up between linguistic description and linguistic knowledge and the term generative is used to refer both to the production of formal objects in a grammar and the production of mental constructs which are represented as underlying the utterance of pieces of language when the occasion for utterance arises. This equation is now being questioned. Sociolinguists in particular are saying that a good deal of what a speaker knows about his language cannot be incorporated into a generative grammar so that the linguistic description it presents cannot be equated with linguistic knowledge. The question is, of course, what kind of description can account for this knowledge? Is there any way of saying the equation? It is precisely this question which is exercising linguists at the moment and which lies behind their concern with illocutions, speech functions, presuppositions, text grammars, discourse analysis and all the rest of it. It is a crucial question for the development of linguistics, but it is a crucial question for the development of language teaching, and in particular for the development of EST? The theoretical view believes that it is: that we cannot teach communicative competence, the ability to handle English use in discourse, until we have a description of it, that teachers cannot proceed to develop this knowledge in their students until the linguists have described it for them. I myself believe that this view is wrong and that it over-complicates the issue. Moreover, I think that it shows just as mistaken a concept of the relationship between linguistics and language teaching as does the operational view.

So far I have done a good deal of criticising, but I have now come to the point at which I must suggest an alternative way of looking at these matters: one which mediates between teaching and research and which brings developments in EST within the scope of practical methodology. The theoretical view is basically that we cannot effectively teach what we cannot explicitly describe, and since we cannot describe the way English is used in scientific and technical discourse, our attention must be directed towards doing so as a preliminary to the design of EST programmes. This leaves the language teacher with nothing to do but to stand and wait. But although we are not in a position to describe discourse in a systematic way, the language user himself knows how to create and understand discourse of different kinds expressed in his own language. This knowledge has not been made explicit in exact descriptions of the kind the linguist would find satisfactory, but do we so completely depend upon such a description for developing means of guiding students to an acquisition of this knowledge? I do not think so.

Let us consider what a practical knowledge of EST might involve. I think that the first point that has to be made is that EST is at one and the same time a variety of English usage and the particular linguistic realisation of a mode of communicating which is neutral in respect to different languages. That is to say,

EST does indeed manifest the system of English in a certain way but the significance of this is that it does so in the expression of concepts and procedures which characterise different technologies and scientific disciplines, and which might be said to constitute their basic communicative system. What I am suggesting, then, is that fields of enquiry in the physical and applied sciences, as these are generally understood, are defined by their communicative systems, which exist as a kind of cognitive deep structure independently of individual realisations in different languages. I think that this communicative deep structure frequently emerges on the surface as mathematical expressions, formulae, graphs, charters, conventionalised diagrams and so on, which take the same form irrespective of the differences of the verbal context in which they occur. We can define scientific discourse, then, as the verbal and non-verbal realisation of the communicative system of science. Now this system has been described under the name of the philosophy of science, and any systematic description scientific discourse in English must therefore take account of this philosophy, which represents the basic principles of scientific enquiry. But does this mean that the teacher must also take account of it in his teaching of EST? This question worries many English teachers: they feel that they cannot possibly teach EST because they are not scientists. It is a question, therefore, which we must consider carefully.

The philosophy or communicative system of a science defines that science as a discipline. The science teacher's task is to develop teaching techniques and materials which will guide his students to acquire a knowledge of this system. In other words, the principles of the discipline are pedagogically processed to fashion a subject for teaching. The teacher of EST is not generally called upon to teach the English discourse of science as a discipline but the English discourse of science as a subject as this has been designed by the methodologists of science. It is not the English teacher's task to design science teaching programmes. He might find it of interest to investigate the philosophy of science as a discipline but what he needs to know something about is the methodology of science as a subject. The reason for this is that the closer the English teacher's methodology can be made to approximate to that of science teaching, the more successful he will be in integrating the two areas of knowledge whose synthesis constitutes relevant English use. I shall return to this point presently.

Meanwhile, let us return to the question of what is involved in a practical knowledge of EST. If what has been said in the preceding paragraph is accepted it will be evident that what students need to know is how English is used to realise the discourse of that level of scientific instruction that they have arrived at. I have already suggested that the communicative systems of different scientific disciplines are independent of any particular linguistic realisation. Can we also say that the methodology associated with different scientific subjects is similarly universal? I think that perhaps we can. I think that it is likely that scientific textbooks written in different languages express essentially the same methodology. Moreover, as with the communicative system of the discipline, I think that this methodology is reflected in certain non-verbal devices of exposition which are common to all textbooks. Now if this is so, then students will have already acquired some knowledge of the communicative systems of science which appear, pedagogically processed, in scientific subjects. How much they know will depend on the stage they have reached in their studies, but they will know something. This knowledge may hitherto have been acquired only through their own language. The English teacher's task is not to develop this knowledge but to demonstrate how it is realised through the medium of a different language. How can this best be done?

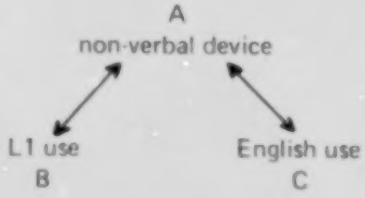
The operational view would presumably be that we teach the vocabulary and structures which are manifested most commonly in English scientific discourse in general. The theoretical view would be that we must first describe and then teach how the communicative systems of the disciplines in question are realised uniquely in English. Underlying both points of view are two assumptions, both of which seem to me to be mistaken. First, it is assumed that the learner has little or no previous knowledge of how language is used in scientific communication. EST is represented as in some sense a separate learning task. The second assumption is that what is to be learned has to be explicitly taught, that knowledge is a kind of model that has to be constructed in the learner's mind rather than a dynamic process which develops of itself. Here EST is represented as in some sense a complete and well-defined learning task. I think that both of these assumptions are wrong and misrepresent the kind of knowledge which students of EST must acquire.

Let us consider the case of a student who enters higher education to study a scientific or technical subject, and who has to read textbooks in English. In his secondary schooling he has, we will assume, acquired knowledge of two kinds. In the first place, he will have some knowledge of English usage,

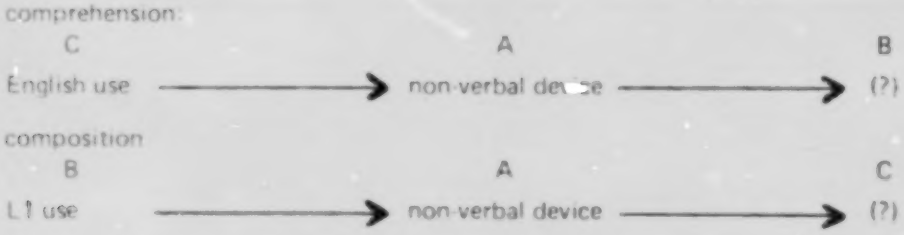
conveyed to him by means of a structural syllabus of the familiar kind. Secondly, he will have learned some science and in consequence he will have some knowledge of how his own language is put to communicative use in scientific discourse of an instructional sort. This learning of science will, of course, have drawn upon the student's more general awareness of how his own language functions as communication. The situation is, then, that the student has some knowledge of English usage and some knowledge of how his own language is put to use in scientific discourse. The task for the teacher of EST is to relate these two kinds of knowledge, to convert usage into use by reference to the student's already existing communicative competence in his own language. EST is best considered not as a separate operation but as a development from, or an alternative realisation of, what has already been learned of existing knowledge. Its first objective is to change the student's concept of English from that which represents it as a separate set of facts about words and sentence patterns and grammatical rules to that which represents it as a means of communication similar in nature to his own language. It is not easy to persuade a language learner to see a foreign language in this light in the context of general education since so many of the situations which are set up to give meaning to the language are obviously contrived for that sole purpose. In the context of EST, however, it is not difficult to convince the student of the communicative reality of the language. What the EST programme has to do is to show him how to cope with it.

I have discussed elsewhere[2] one way in which this might be done. It involves making use of those non-verbal devices which are, as I have already suggested, the universally conventionalised expression of the underlying communicative systems of science. Now since these non-verbal modes of communicating represent some of the basic concepts and procedures of different scientific subjects, they can serve as a point of reference for verbal realisation in the student's own language and in English. What I am suggesting is a translation procedure but as a three-cornered operation. Translation, as it is commonly conceived, converts one structure into another which is thought to have the same meaning by virtue of the semantic equivalence of its linguistic elements. The use of non-verbal devices enables us to relate three ways of expressing the same basic concepts and procedures. In this way, the student can be shown in general how English is used in the same way as his own language and in particular how it is used in the performance of specific acts of communication relating to the communicative system of science. Thus a knowledge of EST can derive from what the student knows of science and the functioning of his own language in association with what he has learned of English usage. This three-way translation procedure can be controlled for difficulty, as it must be of course if it is to function effectively as a teaching device.

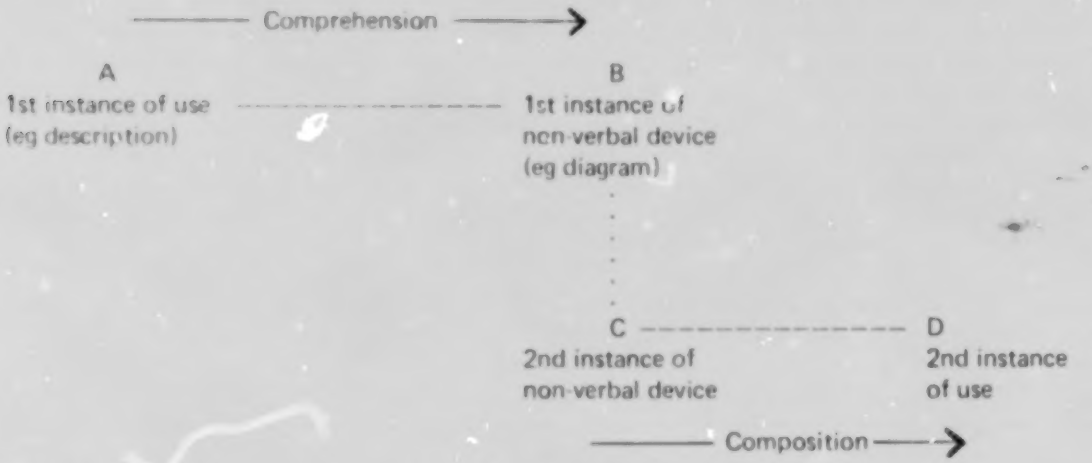
Exercises of this three-way translation type can prepare the way for exercises in which the support of the student's own language is withdrawn and the relationship to be established is directly between non-verbal representations and English use. In exercises of this information transfer type, we have two instances of English use related to the same type of non-verbal device. In the case of three-way translation, we have the following situations:



When the non-verbal device is given with the instance of English use, (C ⟶ A) the provision of the translation is essentially a comprehension task. When the non-verbal device is given with the instance of L1 use (B ⟶ A) then the provision of the translation is essentially a composition task. We might show this as follows:



description of an experiment, a mechanical device, a piece of equipment and so on. This would be the first instance of use. We might then require the student to label a given diagram, or draw a diagram of his own which represented the facts of the description. This would be the first instance of a non-verbal device. The transfer here is essentially a comprehensive task. Next we present a second diagram which represents the same kind of information (realises the same type of concept or procedure) as the diagram that the student has already completed and we now require him to derive a description from it which will be correspondingly similar to the original description, which, of course, acts as a model for this second instance of use. The transfer from the second instance of verbal device to the second instance of use is essentially a composition task. We might represent the process of information transfer as follows:



The dotted lines in this scheme show where control can be applied. It can be applied between A and B by varying the degree of difficulty of the task the student has to undertake: he may be given a partially labelled diagram, or an unlabelled diagram, or an incomplete diagram, or no diagram at all. Control can also be applied between C and D in a similar way: the student might be given key words or phrases, or be asked to assemble an assortment of sentences into a well-formed discourse, or be given no help at all, except of course the possibility of referring to the first instance of use as a model. The control between B and C has to do with the degree of similarity that holds between the instances of non-verbal device, and this will in turn determine the extent to which the first instance of use can be used as a model for the second.

I should like to make two points about the procedures that have been outlined and partially illustrated here. The first of them has to do with the comment I made earlier about the desirability of the English teacher knowing something about the methodology of science teaching. It is obviously central to the purpose of these exercises in mediated translation and information transfer that the language presented and produced should be instances of use and not instances of usage. The students must feel that they are involved in meaningful communicative activity and not just doing a language exercise. This means that the problems they have to solve should as far as possible appeal to the kind of cognitive processes which it is the purpose of science teaching to develop. What this involves in general is an exploitation of science teaching methodology. The suggestions I have made give only a hint of how this might be done[3], but I believe that the teacher of EST would be best advised to seek methodological guidance not from the linguist or the philosopher of science but from the science teacher. His best source of reference is likely to be (at least in our present state of theoretical and descriptive uncertainty) textbooks of science and the experience of his science teaching colleagues. In short, it seems to me that if EST is to be concerned with the teaching of use, then it must be conducted not as a separate operation but as an extension from science education.

My second point relates to the second assumption that I referred to earlier, and here I move on to very uncertain ground with only my intuition to guide me. The exercises I have suggested do not direct the students' attention to features of language in any explicit way: they provide an opportunity for students to induce meanings by reference to their own knowledge. The focus is on the communicative function of use and not on the linguistic forms of usage. The underlying assumption is that usage will come into

focus, that is to say, will conform to norms of correctness, as a consequence of practice in appropriate use. This, of course, is the reverse of the commonly held view that correctness should be of primary concern. But I would like to take a more radical departure from established opinion. The exercises concentrate on use but they do not do so in any very exact way: the student is largely left to work things out for himself within the controlled specification of the problem. Now there is a good deal of talk these days in language teaching circles of the importance of teaching communicative competence, and there is a general assumption that this competence can and should be described with the same degree of precision with which linguistic competence is described in grammars as a preliminary to really effective teaching. It is this assumption that informs what I have called the theoretical approach to EST. Thus both the operational and the theoretical views suppose that precise description is a prerequisite for effective learning, that what is taught and learnt has to be specified in advance as a set of structures or lexical items or communicative acts which are, as it were, stored in the mind for use when required; that once these have been transferred to the store the learning task is done and the rest is a matter of applying this existing knowledge as the occasion arises. This view seems to me to be intuitively wrong. It does not seem to me to explain the way in which language users create discourse ex tempore, how they make sense of language use even when it does not conform to norms of correct usage. It does not seem to me to explain how language develops in the individual and changes in society. What we need, I think, to account for these phenomena is a model of use which deals not in precise rules but in more general strategies and which represents the communicative process not as a matter of correlating what one perceives with already acquired schemes of knowledge but as an 'ongoing accomplishment' (the term is Garfinkel's[4]) whereby one realises as much meaning from instances of use as seems necessary for one's purposes.

What I am suggesting is that descriptions of use in terms of precise rules may give an inaccurate picture of how people use language, that accuracy cannot be achieved by exactness because exactness is not a feature of normal communication. This does not mean, of course, that it is not a valid research aim to devise means of describing use, but I believe that these means will not satisfactorily be found in the postulation of precise rules which will generate discourse structures in the same sort of way that sentences are generated by a grammar. Most linguists think of discourse analysis as an operation on existing data to discover patterns of form or function which can be reduced to rule. I would suggest that we are likely to arrive at a more convincing account of discourse by looking not at the finished object, a piece of existing text, but at the process which creates and interprets it by a combination of knowledge, imagination, reason, common sense and other attributes of the human mind. I cannot help feeling, outrageous though the feeling might seem to be, that literary critics have come closer than linguists to an understanding of the communicative function of language and the ways in which discourse is made[5]. Their approach to language acknowledges at least that meanings in discourse are to be worked out by active interpretation and are not a simple function of correlation, that this interpreting ability depends on more than just a knowledge of pre-formulated rules.

The concept of precision has, of course, been carried over from linguistics to language teaching. The teaching of the structural syllabus is generally carried out in a systematic step-by-step fashion with the intention that each linguistic unit should be thoroughly learned before proceeding with the next, and there is a generous provision for repetition to ensure that it is. No allowance is made in the actual teaching, however, for the relative communicative value of these units as they occur in discourse, so that when it comes to reading comprehension, learners attempt to be too precise, to focus their attention myopically on the meaning of individual linguistic units. The practised reader, however, ranges selectively over discourse and draws from it just such meaning as will satisfy his expectations before he begins to read and the predictions which are set up as he reads. He develops a changing cognitive map, as it were, and takes note of what is of relevance to it and lets pass what is not, using his knowledge of the communicative system of different universes of discourse as a general prompt but not as a script. Many native speakers would fail miserably on comprehension tests of the conventional kind (unless they were given advance warning) because such tests require a close scrutiny of detail which the reader would not normally submit to what he reads, and which would, indeed, interfere with his normal reading process. Comprehension tests are often designed in such a way as to prevent rather than to develop an effective reading ability. They focus too much on detail; they are too precise.

These very tentative observations lead me to conclude that the description of discourse and the interpretative strategies of language users, (whether they are applying these strategies in production or reception) should not be distinct. The task for theory and description is to devise a model of interpretation which will capture its dynamic and extempore character and show how the static knowledge of

rules is converted into communicative activity. I have no idea what a model of this kind would look like, but among current explorations into language use I suspect it would bear a closer resemblance to the work of ethnomethodologists and literary critics than to that of the linguists.

Meanwhile, the language teacher does not have to wait for such a model to be devised. He can treat the kind of speculations I have presented here as initial hypotheses and develop teaching materials to test them for pedagogic potential. With regard to EST in particular he can devise exercises of the kind I have suggested which draw on the student's ability to interpret his own language as use and encourage him to apply the same process to English.

As time goes by, academic research will no doubt yield more insights about language use in discourse in general and about English use in particular. But the devotees of disciplines do not have a monopoly on research: it can also be done by practising teachers drawing their inspiration from ideas already in circulation. The development of EST depends on a reconciliation between the operational and theoretical views as I have described them, on a recognition that theory and practice in language teaching are aspects of the same single if complex activity.

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Notes

1. In, for example:
   'The teaching of English through Science' in Dakin, J, Tiffen, B, and Widdowson, H G: **Language in Education**, OUP 1968.

   'The teaching of rhetoric to students of Science and Technology' in Perren, G (ed): **Science and Technology in a second language** (CILT Reports and Papers **7** 1971).

   'The teaching of English as communication' in **English Language Teaching 27** 1 (1972).

2. For more illustration of the approach which is described in this paper, see: 'An approach to the teaching of scientific English discourse' in RELC Journal Vol **5** 1 (1974).

3. The series **English in Focus** published by OUP explores a number of ways in which Science teaching methodology can be exploited in EST.

4. Garfinkel was the prime mover in the development of ethnomethodology, an approach to the description of discourse which stresses the importance of the creative activity of the participant. The most accessible demonstration of the ethnomethodologist's approach is to be found in: Turner, R (ed): **Ethnomethodology** (Penguin Books 1974).

5. I think that the approaches to discourse description of ethnomethodologists and literary critics have a good deal in common. Both stress the elusiveness of exact meanings, the creative aspect of interpretation, the importance of involvement.

DESIGNING ENGLISH FOR SCIENCE AND TECHNOLOGY (EST) PROGRAMMES IN ACADEMIC SETTINGS FOR OVERSEAS STUDENTS: PROBLEMS AND PERSPECTIVES

Keith Jones & Peter Roe

Plan of Paper **Page Reference**

0. Overview ... 12
- 0.1 Purpose of Paper ... 12
- 0.2 Perspective of Paper ... 12
- 0.3 Argument of Paper ... 12
- 0.4 Summary ... 13

1. The Problem of Understanding **NEEDS** ... 13
- 1.1 Domains of Action or Curriculum Settings ... 13
- 1.2 Agency Roles ... 15
- 1.3 Learning Needs in S & T ... 16
- 1.4 A Systems Perspective ... 16
- 1.5 A Crude Model of Objective Academic Knowledge ... 17

2. The Problem of Deciding on **ENDS** ... 18
- 2.1 The Macdonald-Ross Perspective ... 18
- 2.2 Implications for EST ... 19
- 2.3 The Need for a Usable Linguistics ... 19
- 2.4 An Information Processing Model of the Encoding and Decoding of Academic Knowledge in Texts ... 20

3. The Problem of Designing and Implementing **MEANS** ... 20
- 3.1 A Crude Procedural Model for Design and Implementation ... 20
- 3.2 The Problem of Specifying Enabling Objectives ... 21
- 3.3 An EST Reading Programme Design: Assumptions ... 23
- 3.4 An EST Reading Programme Design: Strategies and Tactics ... 24

4. Conclusions ... 26
- 4.1 The value of models ... 26
- 4.2 The need for a richer theory of learning & language ... 27

Appendices ... 31 – 42

DESIGNING ENGLISH FOR SCIENCE & TECHNOLOGY (EST) PROGRAMMES IN ACADEMIC SETTINGS FOR OVERSEAS STUDENTS: PROBLEMS AND PERSPECTIVES

OVERVIEW

Purpose To provide a position paper that attempts

1. to raise problems to do with the needs that EST programmes are designed to serve

2. to raise problems to do with the ends (the needs that are selected as goals to be arrived at by an EST programme) and the means that might be practised in order to satisfy the ends of a programme

3. to look at these problems as crucial variables and to offer crude models for handling them

4. to suggest what conceptual and organisational perspectives are necessary to develop better models for programme design and evaluation

Perspective The perspective adopted in this paper owes much to Popper[1] but can perhaps be best summarised by the following quotation from W T Bane's Operational Research, Models and Government (1968, HMSO)[2]

> 'For any real-life situation there is no end to the complexity that can be built into its model. To some degree or other everything interacts with everything else, but the art of building a model is to include only those variables or dependencies which have a significant effect on the variables of interest. If this is not done the work of model-building expands into ever-increasing complexity and a steadily retreating completion date. A model is necessarily a simplification for a set of purposes . . . It is used for experiment other than experimenting on the real system, and the objective is to apply the results in reality.'

Argument Programmes are trial solutions[3] whose margins of error will vary according to

1. the delicacy with which the domain (or problem-situation) in which they are to operate is modelled: this is the problem of understanding and representing NEEDS

2. the scope of the response in terms of what needs are selected as **goals** for the programme to aim at: this is the policy problem of deciding on ENDS

3. the nature of the conceptual and organisational resources available for designing a strategy: this is the practice problem of deciding on an experimental set of MEANS

4. the degree to which flexibility is built into the execution of the programme so that the interpretation of needs, the selection of ends, and the experimental means can all be adjusted by feedback: this is the problem of error elimination and redesign, the problem of OPERATIONAL RESEARCH.

The purpose of operational research is to prevent the multiplication of errors. To prevent the multiplication of errors, designs must be based on explicit models. These allow public debate, as well as programme experiment, to suggest sources of errors. It is on representations of reality that most experiments should be carried out. It is this that justifies model building. Educational aid needs its wind-tunnel experiments. Crashing prototypes is an expensive business and doesn't give the client much confidence. Satisfactory models, though, do not exist owing to the compartmentalisation of academic research and the low priority accorded in the past to theoretical discussion at a models' level by ELT practitioners. It is the problems that are important rather than academic preoccupations with the boundaries of a discipline. Accordingly, a new synthesis of perspectives is needed to clarify needs, ends and means.

The central conceptual perspective needed is **a theory of rhetoric that mediates between objective academic knowledge and the sign systems of language, diagram and mathematics.** The central concern of EST is the ACCESSIBILITY of KNOWLEDGE. We thus need a rhetoric that reveals how knowledge is mapped into the print and sound systems of English.

The central organisational perspective is that **EST needs to be put on a proper operational research basis.** This involves the location of appropriate expertise and the provision of adequate funds for

1. conducting think-tank seminars and workshops on models for representing needs, ends, means and the operations of which they are components

2. disseminating the output of 1

3. organising formal conferences to deal with specific problems (relating to specific field projects and involving practitioners and clients) from a variety of theoretical and practical perspectives.

It is only in **this** context that our modelled understanding of the complexities of conducting language learning services for overseas students, whether in their country of origin, Britain or a third country, begins to have predictive value. And it is only **then** that programmed trial solutions to EST problems can be offered with the confidence of a tried technology. Given the growth in demand for EST programmes, of which the petrodollar countries' massive interest in paid education services in this area is only the latest manifestation, the need for such a technology by English-using countries is **urgent.**

Summary In short, the paper is concerned with the variables of the acronym MNEMO: models of needs, ends, means and operations. As no agreed models exist in many cases, the paper, especially from 2.4 onwards, is speculative and offered purely as a basis for discussion.

1. THE PROBLEM OF UNDERSTANDING NEEDS

It is the purpose of this paper to raise problems with regard to EST at sixth form or university level and to do so within the context of a concern for the need for operational research. To quote Bane: 'operational research, by its very nature, is concerned with the solution of practical problems. Such problems are complex in that they arise from the interaction of many factors: they are practical in that they require an answer which if not pressing cannot be put on one side indefinitely and the solution left to work itself out '. For those concerned with EST the first grouping of sets of factors or variables has to do with the domain of action, the particular bi- or multi-lingual society that needs to use English for academic education.

1.1 Domains of action or curriculum settings

The scope of this paper precludes all but the most cursory inspection of this key variable. At its simplest this consists of three variables pursuing the question of the accessibility of knowledge. This is a function

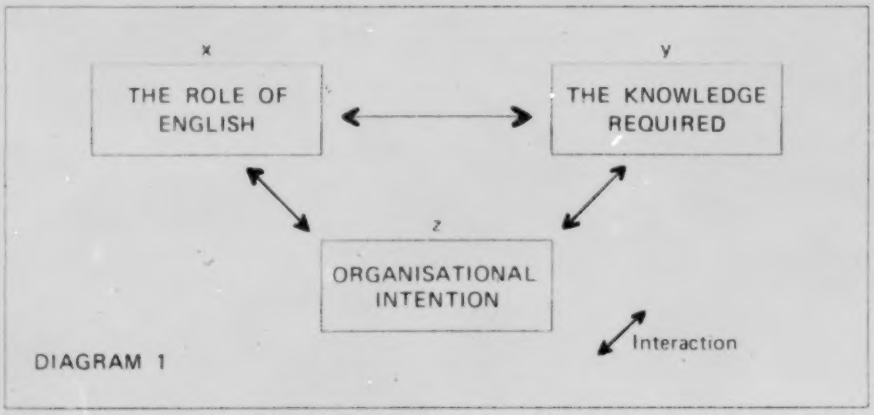


DIAGRAM 1

of educational policy and practice: the policy level presupposes, very often, that variables x, y, z are known and under professional control. But though English may be assigned a role as main or additional study language and defined by reference to other study languages, if any, and the subject or subject-combinations that students study may have a well-structured set of cognitive and behavioural goals, and the organisational intention of the institution may allow space and resources for the intersection of these variables, English for Science and Technology, English as a service subject, that intersection is often not fruitful. Language and subject content have rarely married to produce offspring that carry the concerns of both. EST is still more a hope than a fact. It is not properly established because we have no agreed model, never mind any agreed set of procedures. This does not mean that useful work is not being done, on the contrary, but that useful work is far from a set of optimal procedures and will remain so until the variables that have to be accommodated in any action plan have been located and agreed on. The demand for services is thus in danger of out-stripping the understanding of the problem and, therefore, the action needed to reduce the problem to manageable levels.

The **first** diagnosis to agree on is a categorisation of curriculum settings in terms of what role English plays. A crude sketch of such a categorisation is shown below in a system network:

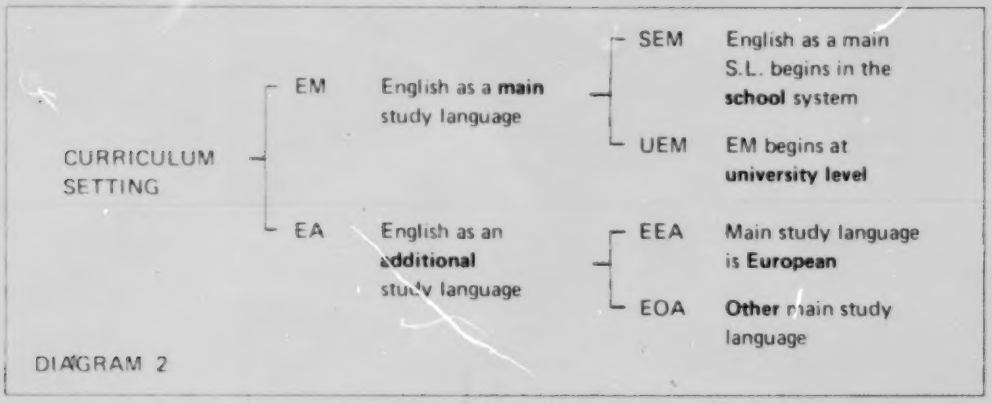


DIAGRAM 2

Presumably, it is possible to quantify this model of settings applying such measures as amount of curriculum time so that the distinction between **main** and **additional** study language can be precisely related on a continuum of ratios between English use and other language use. This, in retrospect, seems a worthwhile minor research undertaking[4]. But, given the ability to apply this distinction precisely, there still looms the range of bi- or multi-lingual combinations that various societies employ. Thus an SEM setting as in Nigeria might imply a multi-lingual setting in which Arabic, Hausa, Kanuri and French might also feature in the semiotic universe of the learner, to name but one of many possible linguistic worlds. What is needed is thus an agreed model that combines simplicity and power so that any particular country can be assigned a setting characterisation that relates it to other settings so that successful programmes in one setting or failures in another can have meaning for the whole enterprise.

The **second** diagnosis to agree on is a model for handling the major variables in the y box in Diagram One – the knowledge required. This implies the need for a theory of academic knowledge. The perspective adopted in this paper is that of Popper's theory of objective knowledge[5]. Popper talks of epistemology without a knowing subject[6]: his arguments begin with the following thesis:

> 'Traditional epistemology has studied knowledge or thought in a subjective sense – in the sense of the ordinary usage of the words 'I know' or 'I am thinking' . . . . (but) . . . . SCIENTIFIC KNOWLEDGE (his emphasis) simply is not knowledge in the sense of the words 'I know'. While knowledge in the sense of 'I know' belongs to what I call the 'second world', the world of SUBJECTS, scientific knowledge belongs to the third world, to the world of objective theories, objective problems and objective arguments'.

They continue with:

> 'Knowledge in this objective sense is totally independent of anybody's claim to know; it is also independent of anybody's belief, or disposition to assent; or to assert, or to act. Knowledge in the

objective sense is KNOWLEDGE WITHOUT A KNOWER: it is KNOWLEDGE WITHOUT A KNOWING SUBJECT.'

Without going all the way with Popper, one can adopt his assertion that knowledge exists in an objective form and that these objective forms include texts. Given this, one can begin to model the y box in Diagram One.

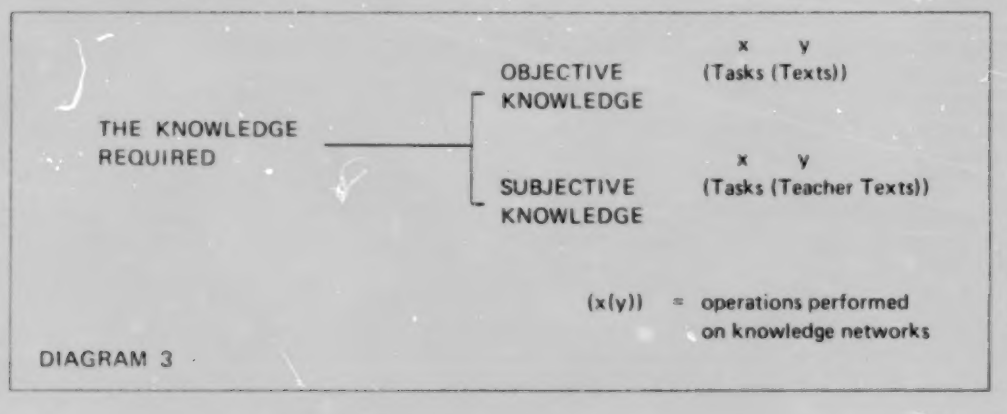


DIAGRAM 3

The point of this crude model is that it indicates that learning tasks in any given S & T subject area have to operate on, in an organised academic setting, two major sources of knowledge display: the written texts selected from commercial publishers' lists by those in control of course planning, whether ministers, universities or sixth form teachers and the spoken 'texts' produced by tutors in formal settings whose input and feedback they largely control. We are thus led to modify Popper's assertion: objective knowledge in the form of texts exists in the sense of a set of marketed options, but which set of options is chosen depends on the individuals in 'power' in a particular cultural setting. One may, or may not, assert that the values of science and technology should be universal; but particular societies with particular planning conceptions may choose differently from the ostensibly universal network of knowledge display. How these particular choices are rendered objective is usually through a syllabus statement, and it is to these, but with the perspective that Diagram Three is intended to reveal, that the EST programme planner has obviously to turn.

The **third** diagnosis to agree on is the concept of organisational intention isolated in Diagram One in box z. This, again, is a teeming complex of variables. Take as a problem situation the following:

> a UEM setting (University using English as its main study language) may be staffed by a mix of local and agency staff in both its Science and Technology and its English Language departments and there must be a variety of cultural as well as individual interpretations as to how to relate the learning goals of subjects with the language needed to explore and express them. Given that, for example, the practice was total compartmentalisation with the Language Department concentrating on drilling conversational English and the S & T Departments requiring fast, efficient and conceptually complex reading skills in English, how would an EST innovator best proceed? How should he understand needs? Would the existing syllabus statement be of much help? Should he accept the Beeby Model [7] and fit into the existing stage of educational thinking on this issue?

The questions can obviously multiply and one is tempted to declaim that it may not only be necessary to understand a syllabus statement of needs but also to change them and so open the Pandora's Box of curriculum development variables.

1.2 Agency roles

The role of agencies in supplying English speaking aid personnel is obviously a major variable in S & T education, English education, and whatever interaction there is between them. Their current view of what EST involves has clearly an impact potential that varies according to their allotted sphere of influence, their training and their current preoccupations. Exploring this issue however cannot be attempted in this paper but it needs stressing that it is only from a position of professional involvement that one can really come to grips with the problem of needs.

1.3 Learning needs in S & T

Although the particular curriculum setting and the particular job description of an EST practitioner exercise powerful constraints on the design of any EST programme, it is possible to model certain universal learning needs (that English will need to serve) if one adopts a curriculum perspective on the types of academic knowledge available in any idealised educational community. Hirst[8] talks of seven **forms** of knowledge – philosophy, history, religion, mathematics, physical sciences, human sciences, literature, fine arts – pointing out that each possesses

1.3.1 distinctive central concepts

1.3.2 particular modes of justifying what is true

1.3.3 particular techniques and skills for exploring experience (algorithms and heuristics)

In addition to these forms of knowledge, Hirst sees combinations of forms resulting in FIELDS of knowledge such as medicine, engineering, geography and education. Clearly, understanding learning needs involves some familiarisation with these concepts, justifications and exploratory techniques into which the student is being initiated either primarily or secondarily through English.

A related curriculum perspective is that of Musgrave[9], who, following Kuhn's[10] analysis of the knowledge stores of the physical sciences, arrives at the conclusion that all academic forms and fields of study can be seen as social SYSTEMS:

> 'a discipline is a social system with its own norms and values, its own styles of thought, its own gatekeepers who watch over the purity of the discipline'

What gives a discipline its unity (though not uniformity – there will be differing visions of the unity by different sets, often schools, of practitioners) is its regulation of properties 1.3.1, 1.3.2 and 1.3.3 by the editors of learned journals, prestigious practitioners, heads of university departments, and other gatekeepers. These gatekeepers, of course, are open to social pressure both through public opinion and the provision of finance and this may involve ideological constraints as well as research priorities. But knowledge is a notoriously difficult enterprise to control and all knowledge systems while remaining systems are likely to remain open systems, though how open is another point.

Perhaps systems thinking provides the best perspective for the crude kind of theory of knowledge the EST practitioner requires if he is to have some conceptual framework in which to understand the learning goals of academic disciplines. Science can be said[11] to study systems by building models to account for the data relationships that those systems seem to exhibit under certain conditions of study and the central place of systems thinking in technology can hardly be gainsaid[12]. Appendix Two reproduces two well-known classifications of systems[13] to indicate the power and range of their perspective on knowledge and justify the reliance on it in this paper.

1.4 A systems perspective

Given this systems perspective we can characterise learning goals in S & T education in terms of models and data. Something like the following ascending hierarchy of curriculum values from subject study to discipline initiation and contribution would seem to be operative:

1.4.1 the ability to process data relationships within a given framework or model without any sophisticated knowledge of the nature of models.

1.4.2 the ability to assess rival frameworks or models.

1.4.3 the ability to use models to sort further data.

1.4.4 the ability to redesign models to account for awkward data.

1.4.5 the ability to design original models for research purposes.

But this is useful only at the most macro level of specification. What the EST practitioner needs is a specification that makes contact with text.

Four features are characteristic of systems[14]. They have structure, a distinctive set of properties, perform operations and undergo changes of state or transformations. These can be shown diagrammatically as:

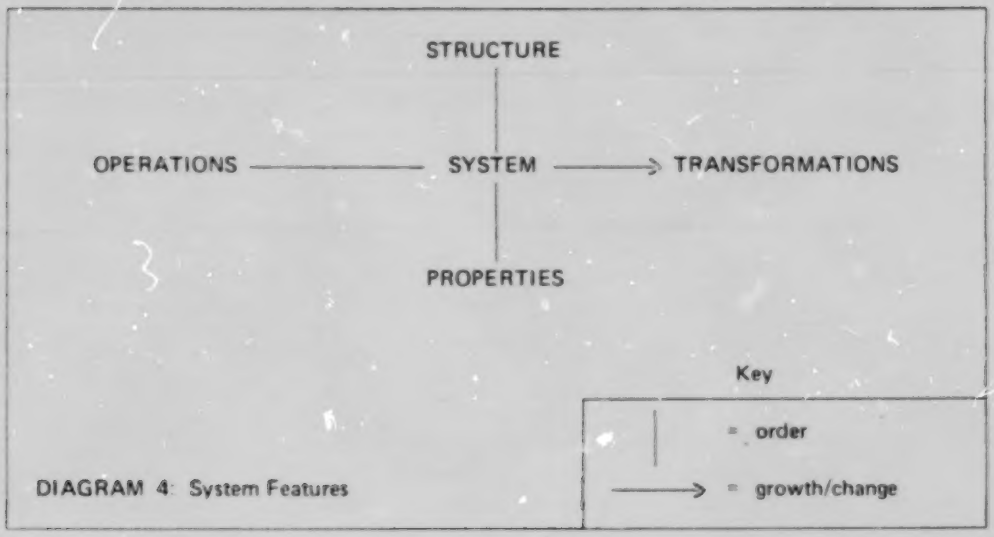


DIAGRAM 4: System Features

It is to the study of these features that S & T address themselves. They tend to do so with the following conceptual procedures:

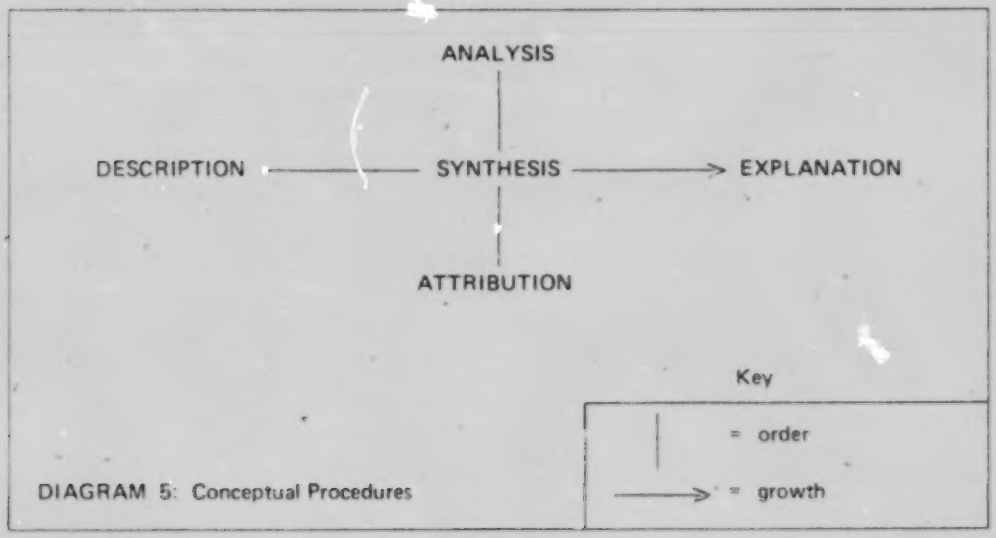


DIAGRAM 5: Conceptual Procedures

Thus, applying the Popper perspective of objective knowledge, it can be argued that S & T have built up by consensus effort a series of data banks on mechanical, physical, biological and social systems. We can thus as in Diagram 6, set out a crude theory of objective academic knowledge as a general framework or model for interpreting the particular learning goals of particular S & T subjects and disciplines. (See Appendix 1 for Diagram 6.)

1.5 A crude model of objective academic knowledge

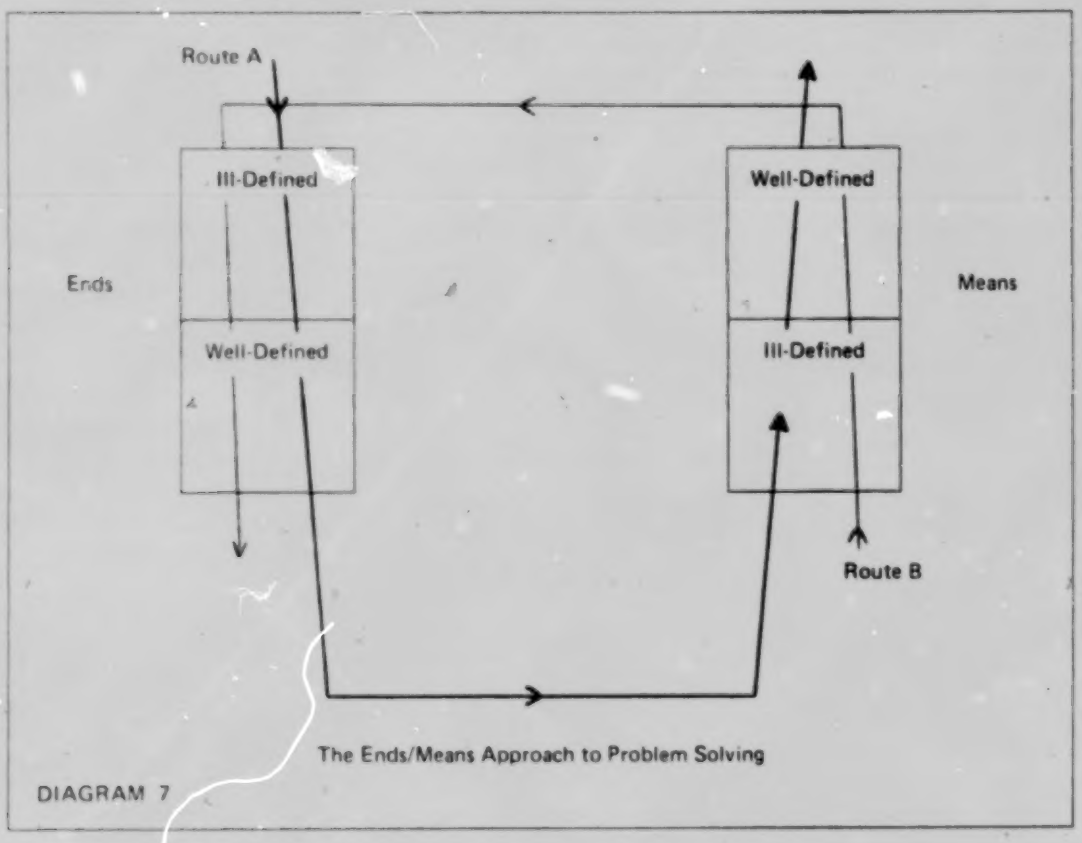
The model shown below in Diagram 6 is taken up later in the paper, expanded and some of its categories exemplified with regard to an actual text. At this stage of the paper it is only intended to have suggestive value. Recent work in EST in Iran at Tabriz uses similar modelling of needs as a basis for its programme design. (A brief discussion of this work can be found in ELT Documents 74/4).

2. THE PROBLEM OF DECIDING ON ENDS

EST is an educational enterprise and must be viewed from a general educational perspective and not as a narrowly applied linguistics problem. Perhaps the most useful context in which to place it is the problem of the defineability of ends and means. These have been most usefully explored in a lengthy paper by Macdonald-Ross[15] on behavioural objectives.

2.1 The Macdonald-Ross Perspective

Any rational planning and design procedure has to come to terms with the fact that most human problems do not have nice and tidy ends and means. They tend to be ill-defined and so any ends/means approach to problem-solving imports its own set of problems into the planning. Were ends and means to be well-defined the problem would become one of merely pressing the right procedure button. A useful model of this problem is offered by Macdonald-Ross, based upon an idea by Lewis[16], that shows how an ill-defined problem can be converted into soluble form via either of two routes, as shown in Diagram 7 (modified and recast from 16).



The Ends/Means Approach to Problem Solving

DIAGRAM 7

To quote Macdonald-Ross[17]: 'Route A, the conceptual route, clarifies ends before means are selected. This puts emphasis upon definition of objectives and on a prescriptive, feedforward mode of planning. Many recent kinds of rational decision making procedures use this route: for example, systems analysis . . . . management by objectives, etc . . . . But despite the publicity given to these new methods most problems get solved by Route B, the expedient route, which uses the information about means to restrict the goals that are aimed for. Route B is closer to the form of traditional evolution, for it stresses feedback, successive adjustment, cycling procedures of design. It is the standard mode for the political animal and has been called piecemeal social engineering (Popper 1945, 1957)[18] . . . . often temporal constraints force planners along this route in practice even though they may express preference for Route A in theory.'

Clearly, given a team approach to programme planning, an optimum design procedure would involve both. Macdonald-Ross[19] characterises open university programme planning procedures:

22

"Although in THEORY objectives come first and everything else afterwards, in PRACTICE all parts of the system can be mutually adjusted until a satisfactory "Fit" is found. This means that the design procedure is really cyclical, with various activities carried on in parallel, and many feedback loops in action. Not only does the finished product get tested and revised, but it is widely conceded that even the objectives themselves should be subject to revision in the light of experience. It can on occasion be dangerous to fix objectives too early."

2.2 Implications for EST

Given that

1. the AIM of an EST programme (the direction in which resources are to be deployed to solve a specific set of communication problems) should be informed by an attempt to use both the conceptual and expedient routes characterised above, and

2. the GOALS of an EST programme (the particular communicative tasks that have to be achieved in English by the S & T student) should be realistically derived from both S & T learning ends and language learning means for achieving them

the policy an EST programme formulates, the aims and goals, requires as conditions for formulation, as a prior input, a modelling of needs and a modelling of means. Given at least some crude modelling of needs and means then EST policy can begin to appraise the four key variables in EST planning: syllabus design and evaluation; materials design and evaluation; examination design and evaluation; and a teacher education programme that is process oriented and concerns itself with an inventive heuristics as well as recommended algorithms. Without such a modelling the scope and delicacy of response are likely to be narrowed and blunted. **Operational research in this area is crucial but bound to be crude as it involves in essence a model of academic knowledge, a model of how meanings crucial to the attainment of academic knowledge are organised in texts, and mapping procedures for relating knowledge to signs and signs to knowledge.** Thus what we need is the perspective of a usable linguistics[20] that offers a theory of language that is also a theory of mind[21].

2.3 The Need for a Usable Linguistics

Schank and Wilks in **The Goals of Linguistic Theory Revisited**[22] point the way towards such a usable linguistics. Much of the current work in the transformational generative paradigm is useless to an EST practitioner. Writing structural diagrams for sentences clearly has its fascination but EST is concerned with meaning and text and meaning doesn't grow on trees[23] and isn't confined to sentences. Schank & Wilks, who operate within the artificial intelligence paradigm not as primarily machine designers but as explorers of the currently most powerful analogy for modelling mind and language use, claim that[24]

> 'Linguistic theory should be concerned with both analysis and generation. Any really adequate theory should provide a base component that is capable of not only analysing and generating but also connecting with a memory that could output to the generative procedure and operate on the output of the analytic one.'

Recent work by Winograd[25] and by Schank and others[26] suggests that systemic theory and certain derivations from case grammar respectively are the most useful ports of call for the explorer of performance models. But their work while helpful and heartening lacks a well-worked-out discourse dimension and given that the EST student reader operating on expository texts is primarily concerned with the way a writer's rhetorical strategy maps information from conceptual addresses into syntactic settings over the course of paragraphs and chapters it is clear that we need a still richer model, a discourse based linguistics rather than one based on 'illustrative sentence fragments'[27]. A crude attempt at this was made in an earlier paper[28] that attempted to apply the model for spoken discourse evolved by Sinclair, Coulthard, et al[29] to the study of written texts within an EST setting. The crucial problem that emerged in this paper was the need for a model that would enable one to judge how communicative purpose was discharged by rhetorical strategy in the service of a rhetorical plan (what's the writer trying to do and how is he going about it?) so that the student's inference from the semiotic data to the communicative intent as well as content could be placed on a sound pedagogic footing in an EST programme. In the section that follows, a

perspective on this problem is attempted. This attempt is more a map of problem variables that need locating and interrelating than a claim to have done so. It is ideally what EST needs a usable linguistics to do.

2.4 An Information Processing Model for the Encoding and Decoding of Academic Texts

Diagram 8 attempts to map the variables of pedagogic interest whose interplay accounts for the efficient reception and production of text in a formal education EST context. The map of mind variables owes much to Sparkes[30] and seems to parallel work in computer-constructed education such as that of Evans [31] and both the derivation of text and mind variables was influenced by a paper on an axiomatics approach to structuring content by Stelzer and Kingsley [32]. It is worth in this context quoting the abstract from Evans' paper on **The Structure of Instructional Knowledge: an operational model**:

> 'This paper presents a two-fold operational partition of structures involved in characterising instructional knowledge. The first structure contains semantic information relating to the areas of information stored. This information is stored in a net together with certain minimal operators defined on the net. A metric is imposed on the relatedness or degree of associativeness of terms. The idea of relatedness is used to resolve ambiguity, direct proper retrieval of content, and permit cognitive updating. In combination with this net is a net of material, taking the form of modules of information. Structure modules store the pointers to the other substructures or to content modules while content modules store 'hard' information about the subgoal associated with the name of the content module, as well as link such material to possibly other structure modules . . .'

The point about this model is that it offers a representation of the interplay between key variables in any EST communication setting that involves texts. This is claimed for spoken as well as written texts (although the model was conceived initially as an attempt to extract and structure key features of the reading process), their production and reception. (With adaptation of the Exposition variable along ethnomethodological lines[33] to account for the dialectic of conversation, it might also be useful in considering seminar conversation but it is most oriented to lecture comprehension and reading required texts). It is thus a model of conceptual, rhetorical and semiotic **needs.** A policy for EST programming would thus involve an assessment of these need-variables, a ranking of them in orders of cruciality and student attainment and the choice of which needs should become the **goals** that the programme **aims** at. It is thus time to consider the problem of designing and implementing **means.**

3. THE PROBLEM OF DESIGNING AND IMPLEMENTING MEANS

At this stage it might be useful to consolidate and draw some of the perspectives together in an attempt at a procedural model. It is taken as axiomatic that such a model should involve programme policy as well as programme practice and that the former is a mapping from a set of needs, the domain of study, to a set of ends, the domain of intention, while the latter, programme practice, is a mapping from the set of ends to a set of means, from a domain of intention to a domain of action. Diagram 9 is an attempt to capture the major variables involved in any EST procedure. It needs emphasising that the entire procedure is seen, here, from a Popper perspective: needs are seen as a set of problems; ends as a choice, from that set, of problems to tackle; means as a trial-solution with a built-in system for detecting and acting upon errors in the trial solution design and for revaluating the interpretation of needs that led to the choice of ends, of goals. Needs, after all, are only someone's diagnosis of what the critical soluble problems are in a complex changing situation.

3.1 A Procedural Model for Design and Implementation

The model in Diagram 9 is crude because it is idealised in various respects. It presupposes **not only** such intangibles as goodwill and flexibility in what is likely to be a situation where the mix of inertia and change in the education system may impose constraints **but also** the existence of conceptual instruments – models for understanding conceptual and linguistic variables that will guide the creation of assessment and teaching instruments. It is thus more an attempt to prescribe

the ideal than describe the real and the value of such a map of the uncertain is largely to raise problems that can either be explored or shown to be already solved. Let us then derive a problem from the model and indicate some of its facets: a central problem is the problem of specifying enabling objectives for an EST programme in the major study skill, reading. Diagram 8 offers certain insights into this problem and will be drawn upon.

3.2 The Problem of Specifying Enabling Objectives

Objectives are sets of conditions that have to be fulfilled before a goal can be achieved. If the goal is to read required S & T texts of a particular length at a particular reading speed either to store as examinable knowledge or to interpret for action then the student needs to be at a certain state of performance ability that can be characterised by giving values to the X variables of $K_x R_x G_x$ where K is knowledge, G is grammar and R the rhetorical mapping. Diagram 8 attempts to locate and gloss what the constituent variables, the components of that performance state, would be. From this can be derived a set of assumptions about the conditions for reading success.

1. Textual substance is a set of variables that includes not only the separate elements of spelling conventions, mathematical formulae and diagram display conventions but also their complicated interplay in e.g. engineering texts. Perceptual efficiency with regard to this interplay cannot be ignored: certain non-Western European students appear to find certain diagrammatic conventions difficult to process, for example[34]. Perceptual efficiency is thus a condition for reading success that needs testing to see if training is required.

2. Semiotic encoding is a very complex set of variables. The meanings a diagram encodes (as opposed to the difficulty of **perceiving** a two-dimensional representation as a three dimensional structure) are holistic and the value of trees for structure analysis and of directed graphs for showing dynamic relations[35] is that they play crucial communicative roles in scientific and technological texts. Fast and efficient understanding of 'iconic' realisations is clearly a condition for reading success. (In addition it is a teaching resource for understanding expository prose.) The same is clearly true of mathematical formalisations: the use of set notation and mapping procedures as teaching resources for students of some mathematical sophistication[36] have to be considered as well as the conditions necessary for comprehending the interplay of formulae and the prose descriptions of the variables they contain. Finally, the way that print has linearised what is not a temporal succession of narrative events whose 'and then' . . . . 'and then' structure is not all that badly served by being played out in successive lines of print but is a highly complex set of dependencies that have to be fractured by the very nature of prose into discrete sentences, which is why diagrams and mathematical expressions are so essential in S & T. The ability fo construct conceptual wholes from syntactic fragments is such an important condition of reading success that the understanding of syntactic settings has to be tested, and taught if found defective. It should always be borne in mind, however, that diagrams and maths sharply increase the redundancy ratio in a text and therefore decrease the degree to which conceptual inference has to rely on syntactic cues[37].

3. But it is at the rhetorical strategy level that the crucial linguistic load is located. An artificial intelligence perspective is useful here. To quote Lindsay[38] in his description of SAD SAM

> 'the major characteristic of comprehension was taken to be the ability to draw inferences from the inputs supplied . . . The system did not focus on "the meaning of a sentence" as the key to comprehension. The problem was that of growing and modifying an information structure represented in consumer memory, and of extracting information from this structure. The structure was called a **map**, which together with **annexing** and **retrieval** processes comprised a model of the domain of discourse.'

This is clearly a perspective we have to adopt in attempting to explain how meanings are organised in texts. It is the rhetorical coherence, as Widdowson notes[39], together with textual cohesion, that is the key to comprehension. Grammatical form is a serial realisation of these. The choices are in the rhetoric: the grammar is a reflex of these. **Rhetoric maps information items from conceptual addresses – theories and evidence – through conceptual procedures**

into serial syntactic settings. It does so hierarchically through choices from an exposition system and as it does so it controls the flow of information through importing presuppositions, glossing and defining new terms and recycling both given and new information through repetition, anaphora, paraphrase and ellipsis – a set of means for acheiving or suggesting equivalence[40].

The scope of this paper is such that there is a little room for exemplification and justification of the categories employed in this part of the paper, but Diagram 10 attempts a suggestive overview of the realisation of information in texts through the twin rhetorical strategies of information management and exposition based on the principles that

1. the creation and decoding of a text involve the growth and modification of an information structure that is best seen in network terms

2. the accordingly dynamic nature of text decoding implies that the instruments for analysis must capture this dynamism

3. therefore conceptual addresses need to be seen as networks of information capable of growth and modification through **transformations**

4. therefore lexical addresses in the sense of items of meaning potential must also be capable of growth and modification with **metaphor** playing an analogous role to transformations

5. therefore the conceptual procedures that guide rhetorical exposition must also be capable of growth and modification with **explanation** playing an analogous role to transformation of content and metaphorical extension of the range of signs

6. therefore the combinatorial power of syntax must likewise be capable of growth and modification above the propositional rank and here **taxis** (parataxis, hypotaxis and adjunction) fulfills this role

7. the **user** of knowledge and sign systems (the expositor with varying command over the knowledge, the semiotics and the rhetoric that maps one into the other) must also be allowed for in the model **so that** his more or less conscious commentary on content, his assumptions about what items can be assumed and which need glossing and defining, his particular rhetorical plan and the way he structures it into stages, moves and acts of communicative intent, and his 'playing' with the set of options that conventional syntax allows, can all be accounted for and, in an educational context, judged.

An attempt to apply these principles and categories is given very tentatively in Diagram 11 using the text shown on page 23 (but excluding the rightmost sentences).

We can conclude this cursory inspection of the problem of specifying enabling objectives with the observation that the degree of delicacy with which they can be specified depends on the delicacy of our modelling of the organisation of meanings in text and of the decoding strategies of the mind[41]. There is cause for concern at the present state of the art in this respect and what Kress and Hodges[42] argue in relation to literary studies can be applied entirely to the studies of scientific and technological texts: we need a usable linguistics that is also a theory of the mind. Widdowson's[43] strictures on the use of an outmoded structuralism are assumed here to be self-evident truths. To specify as enabling objectives structural items based on frequency of tokens as in the Chile tradition[44] in EST is seen as a very usable and necessary procedure particularly in EEA settings (where English is an additional study language in a West European main study language setting and where English rhetorical strategy is reasonably accessible),[45] but it is **not** seen as a sufficient procedure. Frequency counts emerge from text-crushing procedures and what gets crushed in the counting, as Widdowson argues[46], is the communicative function that items play, the dynamic throughput of a text, the functional meaning of discourse. An earlier paper[47] argues in more detail the crucial role that discourse analysis is required to play in the specification of enabling objectives Space does not allow the recapturing of the argument here: but the need for operational research in this area is clearly **urgent**. The conceptual resources available for designing EST programmes are currently insufficient.

But given this lament what can we currently doe? The sections that follow attempt a design for an EST reading programme for sixth formers and undergraduates aimed particularly at SEM and UEM settings such as obtain in Africa and S E Asia.

3.3 An EST Reading Programme Design: Assumptions

The design that follows is grounded in the following negative assumptions derived from the information processing model suggested in Diagram 8:

1. A given corpus of knowledge may not be as systematic as the model implies: the discipline's data-bank may be in disarray (of linguistics and sociology) because the theory banks of rival schools of practitioners may not sufficiently overlap for much common ground to exist, and what is regarded as data may be in dispute **as well as** notions and principles.

2. The text writer (or lecturer within whose structuring of study reading is likely to take place) may not be skilful at converting theory and evidence into text. His rhetoric may be at fault in either or both of information management and exposition.

3. Even if the text writer is skilled, language, by no means the best sign system for S & T reasoning, may be an inadequate vehicle for the data concerned and insufficient or unskilful use of diagrammatic representation may compound the problem.

4. Thus reading difficulty may reside, in varying degrees, in the fuzziness of the text rather than in the reader[48].

5. The student's perceptual efficiency may be insufficient for handling one or more, or the interplay of, diagrams, maths and prose in a text.

6. The student's conceptual processor may not have achieved the threshold level that a particular reading input demands through a deficiency in one or both or the interplay of pattern recognition and problem-solving.

7. The input may be too rich in new information to be held in the short-term memory and matched up with the student's existing knowledge store.

8. The student's formally learnt cognitive strategies may not be easily retrievable, may have been stored as verbal constructs rather than as a set of operations, may have been stored in mistaken order or with mistaken associations, or may be lower-level strategies than the ones a text assumes.

9. The degree of motivation a student brings to a task may be insufficient.

10. The student may process the data in a text without realising its intent[49] or appreciating its applicability.

11. The student's conceptual processor may have to operate with input that is linguistically opaque owing to rhetorical or grammatical deficiencies. He may fail to recognise syntactic settings for the predicate, argument, modality or propositional option systems[50] which can be viewed as grammatical sources of difficulty or he may fail to synthesise the way in which the systems of taxis (systems with much greater combinatorial power because of lesser conventional restraints than in the domain of the proposition) are used for regulating the rhetorical strategy of exposition in stages (**First** we shall discuss . . . . e.g.), moves (X **but** Y where X and Y are propositions e.g.) and acts (X, Y)[51]. (By taxis we are referring to the systems of adjunction[52], coordination and subordination.) There is thus an important distinction to be made between **grammar**, whose mastery may depend more on **pattern recognition procedures** that are common to mankind and not a function of that intelligence which IQ tests claim to measure, and rhetoric, whose mastery may depend more on **pattern synthesis procedures**, which is what IQ tests presumably measure and which are learnable skills heavily dependent on academic education. More formally the distinction can be formulated as follows (to focus on rhetoric in the exposition sense):

1. Grammar is the domain of the **propositional** bracketing of modality, predicates and arguments – or P(M(P(A))) to use bracketing conventions to propose a logical structure that may underlie the conflated structures of surface-syntax[53].

2. . Rhetoric is the domain of **taxis**, where propositions are themselves subjected to bracketing. Bracketing is perhaps not the clearest way of representing fundamental relationships in this domain as dependency rules have yet to be worked out for rhetoric – perhaps because of the latitude that writers allow themselves and because texts are often explorations by the author rather than planned presentations. (Clearly however, prescriptive dependency rules for authors of S & T texts would be highly valuable and handbooks on report writing etc might well be a useful source of insights.) It is all too easy for rhetorical strategy to generate an asymmetrical ordering that meanders and does not connect back to its point of origin sufficiently, precisely because rhetoric lacks the templates of grammar to the extent that writers often fail to deploy taxis signals to mark overtly the course of their exposition.

It also needs noting that while sentence structure, as linguists analysing "illustrative fragments"[54] frequently show, can be viewed as a static structure[55], rhetoric, unlike grammar perhaps, very definitely needs viewing in terms of dynamics. Each proposition that is employed in rhetoric alters the meaning of what previous propositional interplay has created as well as creating expectancies about future propositional deployment. As Sinclair[56] has argued, discourse processing is a prospective and retrospective business. And this is clearly true of both writer and reader as well as speaker and listener.

It is with such potential sources of reading failure in mind that a programme has to be designed. Other more detailed inferences about potential sources of reading failure can be derived from Diagram 8 but are beyond the scope of this paper.

3.4 An EST Reading Programme Design: Strategy and Tactics

A strategy has to spiral if feedback on reality (how an individual student is actually progressing) is to correct and realign the planned learning path through a set of learning resources. Tactics have to be analogues[57] of the learning procedures that EST is attempting to shape and assist. An EST design, therefore, has to be a spiralling succession of tactics that allows different individual rates and routes. Diagram 12 attempts to exemplify such a strategy in a reading comprehension module[58]. This module is conceived as representative of the first stage of a three-stage set of materials for comprehension practice that would need to be supplemented by a sourcebook of explanations and exercises to do with rhetorical strategy and semiotic encoding. Space precludes much commentary on the module but it is intended to be reasonably self-standing. Three points need clarifying:

1. It is axiomatic in this module design **not** to present the student with the very source of his problems (i.e. particular reading passages from required texts) without careful preparation. For this reason the first three twists of the learning spiral begin with specific **learning aids** that attempt to equip the student with the means to tackle texts. The conceptual diagram is an attempt to present the wood before the trees: a diagram is a closure in that it presents a finite set of categories in a relationship map and is thus a more powerful and compact device than prose and has the additional virtues of being a useful mnemonic[60] (and the role given to memory in SEM and UEM settings is a crucially important one) and a useful device for note-taking, or rather formalising the notes one has taken. Practice in conceptual diagram production would be a feature of the sourcebook exercises.

2. Following on from 1 (as has been argued in various points of the paper), the nature of prose as a difficult means, even for native speakers with considerable academic training, for capturing S & T reasoning processes (whether subdued as in an instructional text on, say, anatomy or overt as in a discussion text that evokes theoretical principles) has to be tackled. Conceptual diagrams are a conversion technique that diminish in value as they grow more complex and they need complementing by such format techniques (that display dependency and information management) as the one overleaf[61].

THE STRUCTURE OF THE NERVOUS SYSTEM

The NS is the organ that controls the whole body.

It (NS) has two parts: the central NS and the peripheral NS.

The PNS is made up of nerves, some of which (Nr) you can easily feel in your own Bd.

There is one (Nr) behind your elbow which you can roll against the bone: this is the one you knock when you hit your funny bone.

The brain and spinal cord make up the CNS.

Their (Br & SC) importance is shown by the fact that they (Br & SC) are the most protected part of the Bd, being enclosed inside the bones of the skull and the vertebral column.

The Nr running to the CNS are called afferent Nr and those running from it are called efferent Nr

The AN keep the CNS in touch with the world around the Bd and with the Bd itself.

The EN enable the animal to respond to the Wd: they (EN) run to the muscles and enable the An to move.

The CNS receives the messages from the Nr coded in pulses, rather like the morse Cd: and it (CNS) sends Ms out to the Mu in the same Cd.

The NS consists of Cells, like every other tissue of the Bd.

Here (NS), the main Cl is the NC or neuron; and like all other Cl, it is made up of carbohydrate, protein, salts and fluid.

In the middle of every live Cl is the nucleus, within which (Nc) are the chromosomes and genes.

The Cl, itself, its Nc, and various other structures within the Cl are surrounded by membranes.

The Nr consists of three parts, the CB, the dendrites and the axon.

The value claimed for this format-display learning aid are mainly that indentation indicates dependency relationships (the sentences could in fact be decimalised but the numbering might well distract) and acronymics not only capture the flow of information through a text but can supplement grammatical anaphora through following each anaphoric signal by a bracketed acronym of the item it is deputising for. This form of format display might also be a useful practice tactic for students and would thus feature as an exercise and explanation resource in the kind of sourcebook that a reading comprehension course requires. Students puzzling out how to indent a paragraph and following the playing out of informative items in a text in order to substitute acronyms should gain substantial insight (given the right length and conceptual accessibility of the paragraph or part of paragraphs) into the art (or misapplication of its principles perhaps!) of rhetoric. It might also be useful at first to highlight the leftmost sentences by underlining.

3. A crucial importance is attached to cloze procedures but it is a widely experimented-upon procedure that has already generated its first annotated bibliography[62] and it seems time for considerable experimentation with it as both an assessment procedure and a learning device, the perfect example of a tactic with its own inbuilt assessment procedure. The value of the mechanical cloze test is that four species of item will vie for inclusion:

1. general knowledge items: e.g. **body** or **world** in the text shown in 2

2. technical knowledge items: e.g. **afferent** and **efferent** in 2

3. rhetorical signals: e.g. **it, here, like** (and second-mention/acronym items) in 2 (i.e. interpropositional)

4. grammatical signals: e.g. **is, the, to** (i.e. within propositions)

Mistakes can thus be categorised (and appropriately acted upon) as

1. general knowledge items: either GK deficiency or translation problem

2. technical knowledge items: S & T information problem (a translation problem, perhaps, in an EA setting but unlikely to be in an EM)

3. rhetorical signals: EST problem

4. grammatical signals: EST problem

This is thus a useful sampling device for matching student to text level in a programme, and for assessing technical conceptual complexity as opposed to linguistic complexity in texts. It is, at once, a readability measure[63] helpful in the selection of texts for a programme, a teaching device for bringing contextual information to bear on the resolution of difficulties in comprehension and an assessment tactic that can be built into modules and regulate the learning path of the individual student. The chances of proper selection of texts for a programme would be further enhanced if the device of clozentropy were to be used. This would mean a population of readers assumed to be competent, perhaps lecturers in the subject concerned or sixth form teachers, would attempt the mechanical cloze procedure for a set of pre-selected passages so that their failures could be computed for particular items on the basis of which there would be a **quantified** basis for the progression of texts in the leading programme.

But this last point reveals the selection problem as, however massive the clozentropy procedure, requiring some principles for initial selection. These can be

1. purely pragmatic. S & T departments could be asked to identify and conceptually grade them. Given collaboration, this seems the best recommendation though if the programme is to serve a variety of disciplines certain problems of collating advice would be required.

2. through applying the schedule shown in Diagram 13 in Appendix Two.

4. CONCLUSIONS

4.1 The value of models

Models, like poems, are closures on experience. Neither can match reality, only approximate it. Both are perhaps best judged more on what insight they offer than on the exactness of the detail with which they are furnished, though, clearly, the richer the detail that insight can carry, the better. But just as most poems are unread, most models are unused. It would be counter-productive to suggest or insist that teachers involved in day-to-day problems should see their individual students as 'information processing systems'. The neatness with which models order everyday reality is a neatness at one remove from everyday contact and the range of that remove varies in inverse proportion with the degree to which special terminology is employed by the model-makers. It is especially ironical that the study of communication – how intention and interpretation can and do converge – bristles with what is so often impenetrable jargon to the front-line communicators – the teachers. This though is only partly a blame assignable to theorists: much of the problem can be attributed to the inertia of education systems that allow pride of place to the provision and memorisation of detail rather than to the promotion of divergent and convergent, creative and critical ways of thinking, feeling and doing (Gradgrind is alive and well and living in too many examination controllers)[64]. Models are reasoning games involving an understanding of the principles of order and change[65]. They should be used more and might be if their chief virtue was more clearly stated: their main use is in the prevention of errors in planning rather than in the creation of insights in practice. The good teacher is not the consciously formulating one who sees abstractions instead of individuals at their desks: he is much more likely to be skilled in creating and sustaining human contact, nearer to the theatre than the study. But it is not only the everyday teacher who designs syllabuses and creates materials: these require time away from the classroom and it is precisely here that models are required.

4.2 The need for a richer theory of learning and language

Before anything else, EST practitioners are educators and have to be eclectic about the perspectives they adopt in trying to assist and shape the learning process towards socially agreed goals. They therefore need commonsense guidelines so that the latest fashion in theory can be cut down to size. Ideally, of course, they should be able to shape research towards their ends: linguistics, eg has been far too formal in its research and has only just had the courage to tackle meaning on as broad a front as Firth[66] suggested in the 1930's. We are just moving out of an era in which poverty-stricken models of behaviourism and structuralism reduced language teaching to the banalities of parroting sentence patterns into machines in the vague hope that some internalisation of syntax would take place and appropriately inform the communicative strategies of the learner in real-life, real-time settings[67]. What we need is a richer theory of learning. There is much to be gained from work in artificial intelligence,but like all paradigms it is founded on an analogy that only has partial validity: the mind is not to be captured by any easy gloss like 'biocomputer', however much illumination it may give. What we need is what the practitioners of gestalt psychology claim[68]: to revert to their terminology, gestalt psychologists assume that

4.2.1 experience is an interaction between a person and his environmental field, the environmental field being interpreted as socio-cultural, animal and physical;

4.2.2 'all contact is **creative** adjustment of the organism and environment . . . . psychology is the study of creative adjustments. Its theme is the ever-renewed transition between **novelty** and routine, resulting in assimilation and growth . . . .'

4.2.3 'the assimilating of novelty . . . . is never merely a rearrangement . . . . but a configuration containing new material from the environment, and therefore **different** from what could be remembered (or guessed at), just as the work of an artist becomes unpredictably new to him as he handles the material medium.'

4.2.4 'the self is precisely the integrator; it is the **synthetic** unity, as Kent said. It is the artist of life. It is only a small factor in the total organism/environment interaction, but it plays the crucial role of finding and making the meanings.'

The degree to which such a characterisation of experience and growth commands respect by narrow practitioners in the social sciences is in a sense irrelevant: we need to place our models of learning in a context of **values** at least as rich as those which restalt psychology operates with. And just as the poverty of behaviourist psychology needs banishing,so does the emaciated view of language as an object, of a set of all and only grammatical sentences. The model of language organisation advocated in this paper – that of rhetoric mapping knowledge into grammar – attempts this. But, clearly, major collaborative work within the context of operational research is needed if the next decade of language learning policy and practice is not to be maimed by inadequate modelling of the variables involved. This is a long-term view of EST requirements but we have in the general field of ELT muddled through with only short-term perspectives for far too long.

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ETIC

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1 See Sir Karl Popper (passim): **Objective Knowledge,** OUP, 1972.

2 Thanks are owed to Tim Johns for drawing attention to W T Bane's **Operational Research, Models and Government,** HMSO 1968.

3 Op.cit.; see 1, p.114.

4 ETIC is undertaking research in this area.

5 Op.cit.

6 See especially pp.106–152. A book of logarithms is an example of knowledge without a knowing subject. The knowledge is there on display, but no one, not even the author, carries it all around in his head.

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10 T S Kuhn: **The Structure of Scientific Revolutions,** Chicago 1962.

11 Cf. R Harre: **Introduction to the Logic of the Sciences,** Macmillan 1960; and **Systems Thinking,** Penguin Modern Management Readings, Penguin 1969.

12 The first unit in the Open University Foundation course on Technology is entitled **Systems.**

13 Taken from 12.

14 Cf.11.

15 M MacDonald-Ross: 'Behavioural Objectives: A Critical Review' in **Instructional Science** 2:1 (1973).

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31 S Evans: 'The Structure of Instructional Knowledge: An Operational Model' in **Instructional Science 2** (1974).

32 J Stelzer and E Kingsley: 'Axiomatics as a Paradigm for Structuring Subject Matter' in **Instructional Science 3** (1975).

33 Ie as a component characterised by ongoing – encoding as opposed to formal pre-planning. Thus conversation may be largely structured as it goes along, as in accidental or cocktail-party conversation. Plans may be frustrated and 'stages' in one's conversation might be socially somewhat of a risk.

34 See Helen Coppen: **Visual Perception**, Commonwealth Secretariat 1970.

35 See R Gavaré: **Graph Description of Linguistic Structures. A Linguistic Approach to the Theory of Graphs.** Almqvist & Wiksell, Stockholm, 1972.

36 Particularly considering how set theory and mapping are introduced in the new Mathematics in the first year of primary school in many countries. It is worth considering to what extent Language and Mathematics, the major semiotic systems used to transmit knowledge content in the curriculum, could cross-fertilize in an EST context.

37 The idea of syntactic cues is derived from Goodman: 'Reading as a psycho-linguistic guessing game' in **Language and Reading** (ed Gunderson) Centre for Applied Linguistics, USA, 1970.

38 R K Lindsay: 'In Defence of Ad Hoc Systems' in **Computer Models of Thought and Language,** op.cit.22.

39 H G Widdowson: 'An Applied Linguistic Approach to Discourse Analysis'. PhD dissertation.

40 See Diagram 14 for a suggested characterisation of the information management system.

41 The use of delicacy here is intended to evoke its use in systemics as practised by Michael Halliday.

42 Op.cit.20.

43 See the accompanying paper by Widdowson in his collection.

44 See **ELT Documents 74/4**; also Ewer and Latorre: **A Course in Basic Scientific English** (Longman 1969).

45 The whole business of comparing rhetorics is an urgently needed research undertaking. Presumably many of Whorf's insights would be applicable.

46 Op.cit.43.

47 Op.cit.28.

48 A vivid demonstration of this was given by Ronald Wardhaugh in a paper presented to the RELC 9th Regional Seminar in July 1974: **Reading technical prose.**

49 The importance of this point is owed to John Sinclair.

50 The theory of Grammar aimed at here and elsewhere is some as yet to be realised synthesis of systemics, case grammar and dependency theory.

51 For further discussion, see 28.

52 Op.cit.28.

53 Ways in which options from different systems are fugally present or conflated in surface syntax positions is demonstrated by Halliday in 'Language Structure and Language Function' in **New Horizons in Linguistics,** Penguin 1970.

54 Op.cit.27.

55 Cf.Hoffman, op.cit.23.

56 Op.cit.29

57 This observation is owed to Robin James.

58 The development of this module design owes much to Janelle Cooper and Chris Ttofi.

59 Materials are being prepared for experimentation and publication.

60 The art of memory has been sharply neglected in contemporary pedagogy despite the inordinate demands placed on the memorising of notes and model answers by many examination systems. Frances Yate's **The Art of Memory** is a fascinating excursion into Renaissance pedagogy, and her perspective together with that of the Gestalt psychologists emphasises the importance of diagrammatic closures for understanding and storing in retrievable fashion.

61 Taken from Nathan: **The Nervous System,** Penguin 1972.

62 See **The Cloze Procedure,** Papua and New Guinea University of Technology, Lae, 1973.

63 See J Anderson: 'A Technique for measuring reading comprehension and readability' in **ELT 25:2** (1971).

64 'In this life, we want nothing but Facts, sir; nothing but Facts!' – Dickens: **Hard Times** Book 1, Chapter 1.

65 See especially G I Gibbs **Scientific Concepts & Gaming** in Programmed Learning & Educational Technology 11:1 (1974) for a systems approach to teaching science to non-specialists that capitalises on model-building procedures.

66 **Selected Papers of J R Firth** (ed Palmer), Longman 1968.

67 This paradigm shift is commented on in more detail in the accompanying papers by Widdowson and by Candlin, Moore and Kirkwood.

68 Perls, Hetterline and Goodman: **Gestalt Therapy: Excitement and Growth in the Human Personality,** Penguin 1973.

APPENDICES

Appendix 1

Diagram 6	A Crude Model of Objective Academic Knowledge
Diagram 8	An Information Processing Model of the Encoding and Decoding of Academic Knowledge in Texts
Diagram 9	Crude Procedural Model for Designing and Implementing EST Programmes
Diagram 10	
Diagram 11	Mapping Content into Grammar Key to Code
Diagram 12	Design for EST Reading Comprehension Module
Diagram 13	Criteria for the Selection of EST Texts
Diagram 14	Information Management Options

Appendix 2

Systems Classification

DIAGRAM 6: A CRUDE MODEL OF OBJECTIVE ACADEMIC KNOWLEDGE

0	SYSTEMS Mechanical Physical Biological Social	SYNTHESIS through established** principles, basic principles, secondary notions and primary notions
1	STRUCTURES Holons* Parts Sub-parts Interfaces	ANALYSIS using primary notions and basic principles
2	PROPERTIES Functions Measurables Ascriptions Characterisations	ATTRIBUTION of secondary notions
3	OPERATIONS Processes Phases Participants Circumstances	DESCRIPTION using primary and secondary notions and basic principles
4	TRANSFORMATIONS 'Final' state Causal mechanism Consequences Predictions	EXPLANATION the establishment of new principles from basic principles
	EVIDENCE SEEN AS ADDRESSES IN A DISCIPLINE'S DATE-BANK	**CONCEPTUAL PROCEDURES UNDERLYING EVIDENCE** SYSTEMATISED BY A DISCIPLINE

* Wholes that at higher levels function as parts.

** The idea of principles and notions is taken from the paper referred to in footnote 32.

DIAGRAM 8

AN INFORMATION PROCESSING MODEL OF THE ENCODING AND DECODING OF ACADEMIC KNOWLEDGE IN TEXTS

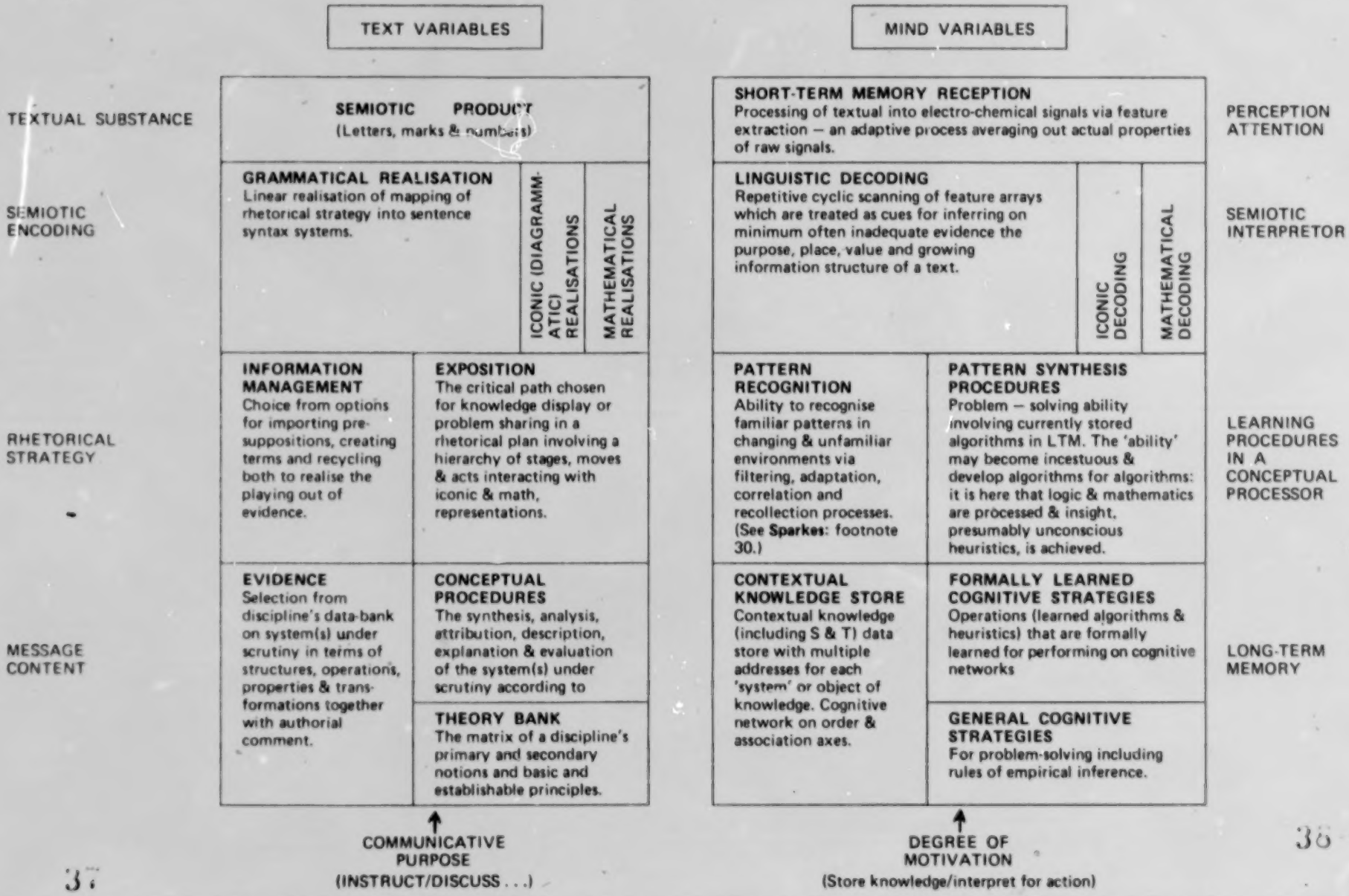

TEXT VARIABLES
MIND VARIABLES
TEXTUAL SUBSTANCE
SEMIOTIC ENCODING
RHETORICAL STRATEGY
MESSAGE CONTENT
SEMIOTIC PRODUCT
(Letters, marks & numbers)
GRAMMATICAL REALISATION
Linear realisation of mapping of rhetorical strategy into sentence syntax systems.
ICONIC (DIAGRAMMATIC) REALISATIONS
MATHEMATICAL REALISATIONS
INFORMATION MANAGEMENT
Choice from options for importing presuppositions, creating terms and recycling both to realise the playing out of evidence.
EXPOSITION
The critical path chosen for knowledge display or problem sharing in a rhetorical plan involving a hierarchy of stages, moves & acts interacting with iconic & math, representations.
EVIDENCE
Selection from discipline's data-bank on system(s) under scrutiny in terms of structures, operations, properties & transformations together with authorial comment.
CONCEPTUAL PROCEDURES
The synthesis, analysis, attribution, description, explanation & evaluation of the system(s) under scrutiny according to
THEORY BANK
The matrix of a discipline's primary and secondary notions and basic and establishable principles.
SHORT-TERM MEMORY RECEPTION
Processing of textual into electro-chemical signals via feature extraction – an adaptive process averaging out actual properties of raw signals.
LINGUISTIC DECODING
Repetitive cyclic scanning of feature arrays which are treated as cues for inferring on minimum often inadequate evidence the purpose, place, value and growing information structure of a text.
ICONIC DECODING
MATHEMATICAL DECODING
PATTERN RECOGNITION
Ability to recognise familiar patterns in changing & unfamiliar environments via filtering, adaptation, correlation and recollection processes. (See Sparkes: footnote 30.)
PATTERN SYNTHESIS PROCEDURES
Problem – solving ability involving currently stored algorithms in LTM. The 'ability' may become incestuous & develop algorithms for algorithms: it is here that logic & mathematics are processed & insight, presumably unconscious heuristics, is achieved.
CONTEXTUAL KNOWLEDGE STORE
Contextual knowledge (including S & T) data store with multiple addresses for each 'system' or object of knowledge. Cognitive network on order & association axes.
FORMALLY LEARNED COGNITIVE STRATEGIES
Operations (learned algorithms & heuristics) that are formally learned for performing on cognitive networks
GENERAL COGNITIVE STRATEGIES
For problem-solving including rules of empirical inference.
PERCEPTION ATTENTION
SEMIOTIC INTERPRETOR
LEARNING PROCEDURES IN A CONCEPTUAL PROCESSOR
LONG-TERM MEMORY
COMMUNICATIVE PURPOSE
(INSTRUCT/DISCUSS . . .)
DEGREE OF MOTIVATION
(Store knowledge/interpret for action)

DIAGRAM 9

CRUDE PROCEDURAL MODEL FOR DESIGNING & IMPLEMENTING EST PROGRAMMES

(NB The ends chosen below constitute only one possible choice)

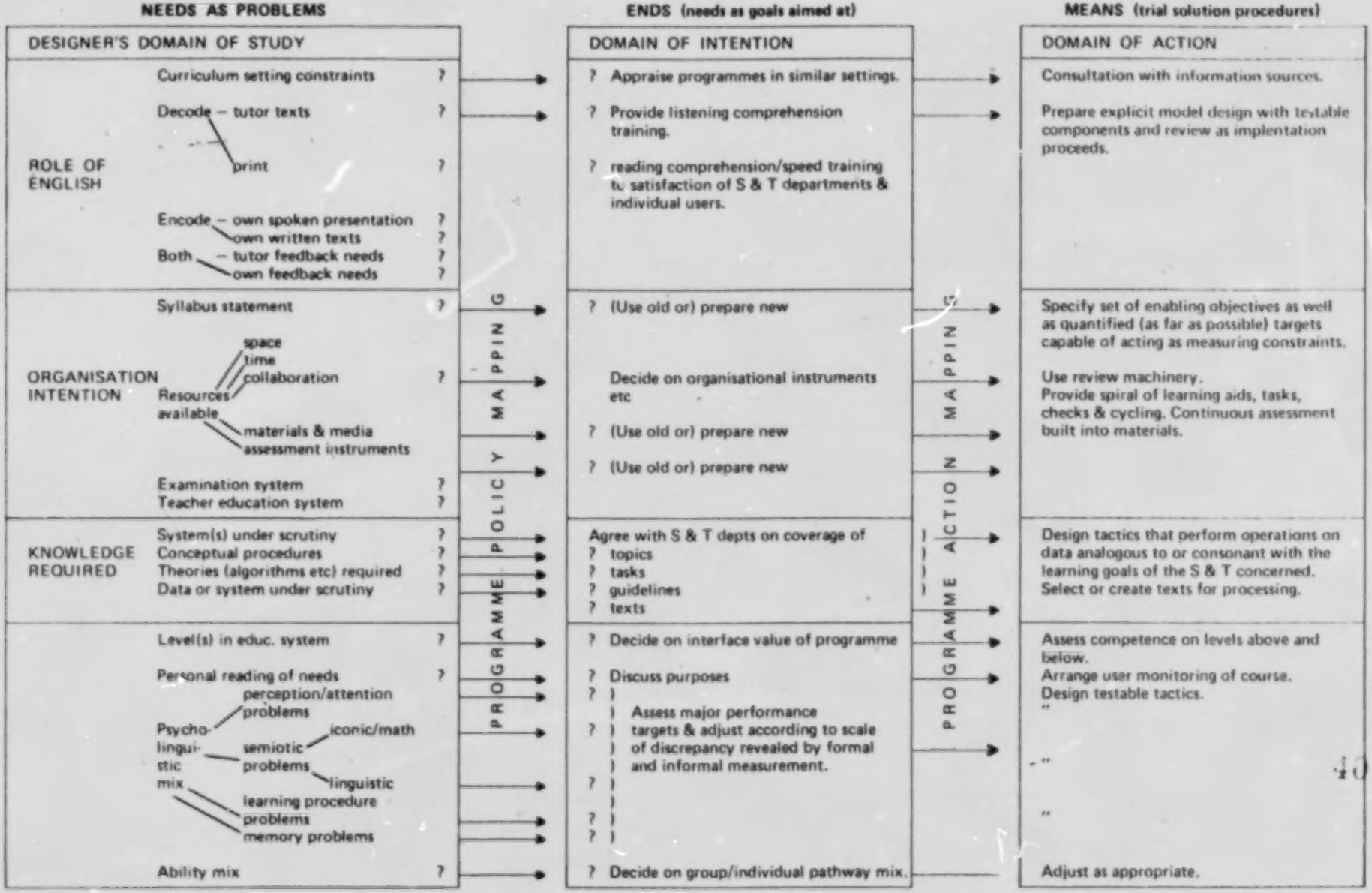

NEEDS AS PROBLEMS
ENDS (needs as goals aimed at)
MEANS (trial solution procedures)
DESIGNER'S DOMAIN OF STUDY
DOMAIN OF INTENTION
DOMAIN OF ACTION
ROLE OF ENGLISH
Curriculum setting constraints ?
Decode – tutor texts ?
print ?
Encode – own spoken presentation ?
own written texts ?
Both – tutor feedback needs ?
own feedback needs ?
? Appraise programmes in similar settings.
Consultation with information sources.
? Provide listening comprehension training.
Prepare explicit model design with testable components and review as implentation proceeds.
? reading comprehension/speed training to satisfaction of S & T departments & individual users.
ORGANISATION INTENTION
Syllabus statement ?
Resources available
space
time
collaboration ?
materials & media
assessment instruments
Examination system ?
Teacher education system ?
? (Use old or) prepare new
Specify set of enabling objectives as well as quantified (as far as possible) targets capable of acting as measuring constraints.
Decide on organisational instruments etc
Use review machinery.
Provide spiral of learning aids, tasks, checks & cycling. Continuous assessment built into materials.
? (Use old or) prepare new
? (Use old or) prepare new
KNOWLEDGE REQUIRED
System(s) under scrutiny ?
Conceptual procedures ?
Theories (algorithms etc) required ?
Data or system under scrutiny ?
Agree with S & T depts on coverage of
? topics
? tasks
? guidelines
? texts
Design tactics that perform operations on data analogous to or consonant with the learning goals of the S & T concerned.
Select or create texts for processing.
Level(s) in educ. system ?
Personal reading of needs ?
Psycho-linguistic mix
perception/attention problems
iconic/math
semiotic problems
linguistic
learning procedure problems
memory problems
Ability mix ?
? Decide on interface value of programme
Assess competence on levels above and below.
? Discuss purposes
?) Assess major performance ?) targets & adjust according to scale) of discrepancy revealed by formal) and informal measurement.
Arrange user monitoring of course.
Design testable tactics.
"
"
"
? Decide on group/individual pathway mix.
Adjust as appropriate.
PROGRAMME POLICY MAPPING
PROGRAMME ACTION MAPPING

DIAGRAM 10

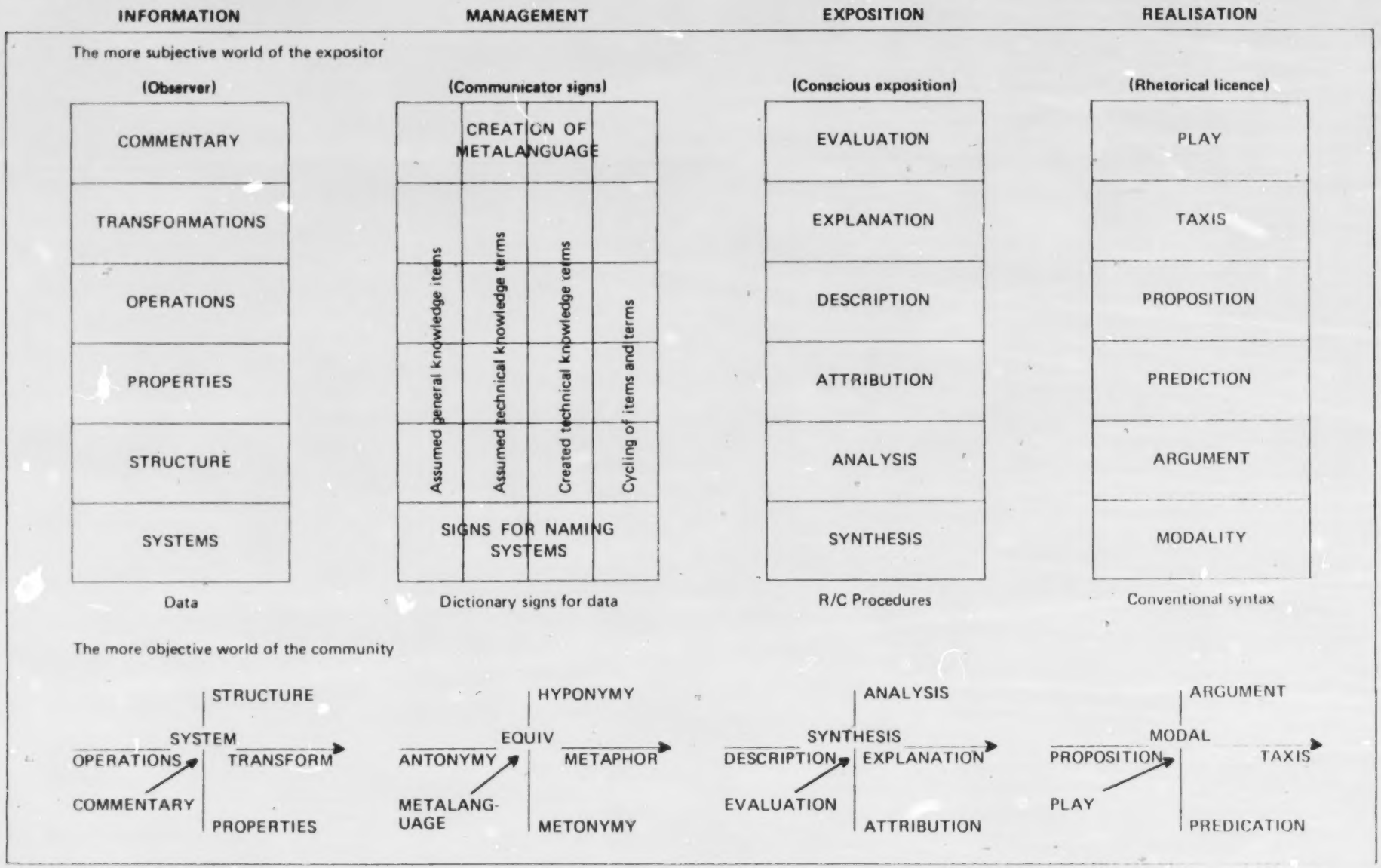

INFORMATION
MANAGEMENT
EXPOSITION
REALISATION
The more subjective world of the expositor
(Observer)
(Communicator signs)
(Conscious exposition)
(Rhetorical licence)
COMMENTARY
TRANSFORMATIONS
OPERATIONS
PROPERTIES
STRUCTURE
SYSTEMS
CREATION OF METALANGUAGE
Assumed general knowledge items
Assumed technical knowledge terms
Created technical knowledge terms
Cycling of items and terms
SIGNS FOR NAMING SYSTEMS
EVALUATION
EXPLANATION
DESCRIPTION
ATTRIBUTION
ANALYSIS
SYNTHESIS
PLAY
TAXIS
PROPOSITION
PREDICTION
ARGUMENT
MODALITY
Data
Dictionary signs for data
R/C Procedures
Conventional syntax
The more objective world of the community
STRUCTURE
SYSTEM
OPERATIONS
TRANSFORM
COMMENTARY
PROPERTIES
HYPONYMY
EQUIV
ANTONYMY
METAPHOR
METALANG-UAGE
METONYMY
ANALYSIS
SYNTHESIS
DESCRIPTION
EXPLANATION
EVALUATION
ATTRIBUTION
ARGUMENT
MODAL
PROPOSITION
TAXIS
PLAY
PREDICATION

DIAGRAM 11

MAPPING CONTENT INTO GRAMMAR

META-COMMENT

EVALUATION → COMMENTARY
- Theory oriented
- Reader oriented
- Code oriented
- Self oriented
- – conflations + juxtapositions

COMMENT

EXPLANATIONS → TRANSFORMATIONS
- Final state of system
- Causal mechanism — facilitators / constraints
- Consequences
- Predictions
- – conflations + juxtapositions

DESCRIPTION → OPERATIONS
- Processes
- Phases
- Player — intent / role
- Circumstances — time focus / space focus
- – conflations + juxtapositions

ATTRIBUTION → PROPERTIES
- Functions
- Measurables
- Objective properties
- Subjective properties
- – conflations + juxtapositions

ANALYSIS → STRUCTURES
- Holons
- Parts
- Sub-parts
- Arrangement — pattern / interfaces
- – conflations + juxtapositions

TOPIC

SYNTHESIS → SYSTEMS
- Mechanical
- Physical
- Biological
- Social — symbolic / sociological
- – conflations + juxtapositions

NOISE → JOKERS

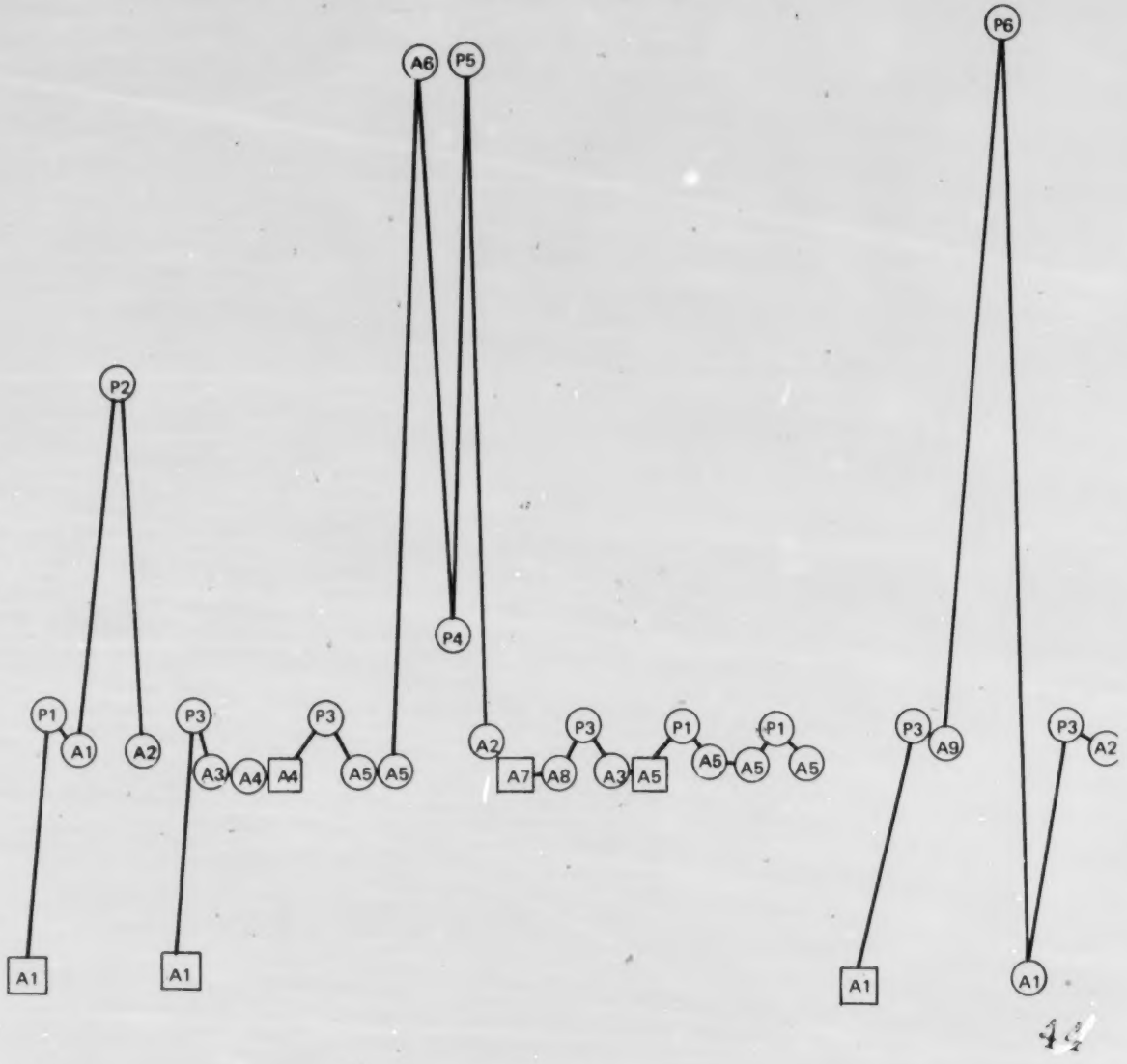


DIAGRAM 11: KEY TO CODE

NOTES

		INFORMATION MANAGEMENT	EXPOSITION
A1	The nervous system	Term	Topic
P1	is	Gloss	Scope
A1	the organ		
P2	that controls		
A2	the whole body		
		ACT OF DEFINITION	ACT OF DELIMITATION
A1	it	Retrieval	
P3	has two parts	Possession	Analysis
A3	the central NS	Term	Node
A4	& the peripheral NS	Term	Node
		ACTS OF CLASSIFICATION	ACT OF ANALYSIS
A4	the PNS	Retrieval	Analysis
P3	is made up of		
A5	nerves	Term	
A5	some of which	Gloss	Exemplification
A6	you		
P4	can easily feel		
P5	in your own		
A2	body		
		OSTENSIVE EXEMPLIFICATION	ACT OF ANALYSIS & EXEMPLIFIC.
A7	the brain	Term	Analysis
A8	& spinal cord	Term	
P4	make up		
A3	the central NS	Retrieval	
			ACT OF ANALYSIS
A5	the nerves running to the CNS	Gloss	
P1	are called		
A5	the afferent nerves	Term	
A5	those running from it	Gloss	
P1	are called		
A5	efferent nerves	Term	
		ACT OF DEFINITION	
A1	the NS	Retrieval	Analysis
P4	consists of		
A9	cells	Term	
P6	like every other	Gloss	Theory reference
A1	tissue		
P3	of		
A2	the body		

DIAGRAM 12

DESIGN FOR EST READING COMPREHENSION MODULE

LEARNING AID	LEARNING TASK	LEARNING CHECK	LEARNER CYCLING	CYCLE
Conceptual diagram of communication purpose & Rhetorical plan of passage.	To gain overview of required reading passage by digesting the CD.	Conceptual cloze test on short prose commentary on CD. Gaps fillable by reference to CD.	Scores below 70% are recycled with peer/tutor assistance.	Recycle 1 → 1 → Cycle 2
Search questions (1 or pair) so that processing of text is problem guided. Target text employs format that reveals sentence dependence via indentation, technical primary notions via bold print & anaphora via acronyms.	Read target text with a view to answering search questions and through paying greater attention to leftmost sentences. Preview of bold print notions indicates degree of dictionary assistance.	Set(s) of statements are presented whose validity has to be inferred from answers noted by student in response to search questions.	Scores below 70% are recycled with peer/tutor aid.	Recycle 2 → 2 → Cycle 3
Rhetorical operations such as comparison (depending on text use) are explained and imported technical primary notions are diagrammatically glossed.	To develop insight into rhetorical strategy by manipulative & recognition exercises.	Suggested solutions to manipulative & answers to recognition exercises.	Scores below 70% are assigned to source-book of explanations & exercises.	Assign to sourcebook → 3 → Cycle 4
All foregoing with cycle 3 being an optional cycle depending on performance in cycles 1 & 2.	Recreate original text.	Mechanical cloze test (every tenth word) of target text without format assistance.	General knowledge, conceptual, rhetorical & grammatical cloze scores computed. Scores below 38% assigned to source-book.	Assign to sourcebook → 4 → Next module

Cycle 4 if score high

DIAGRAM 13

CRITERIA FOR THE SELECTION OF EST TEXTS

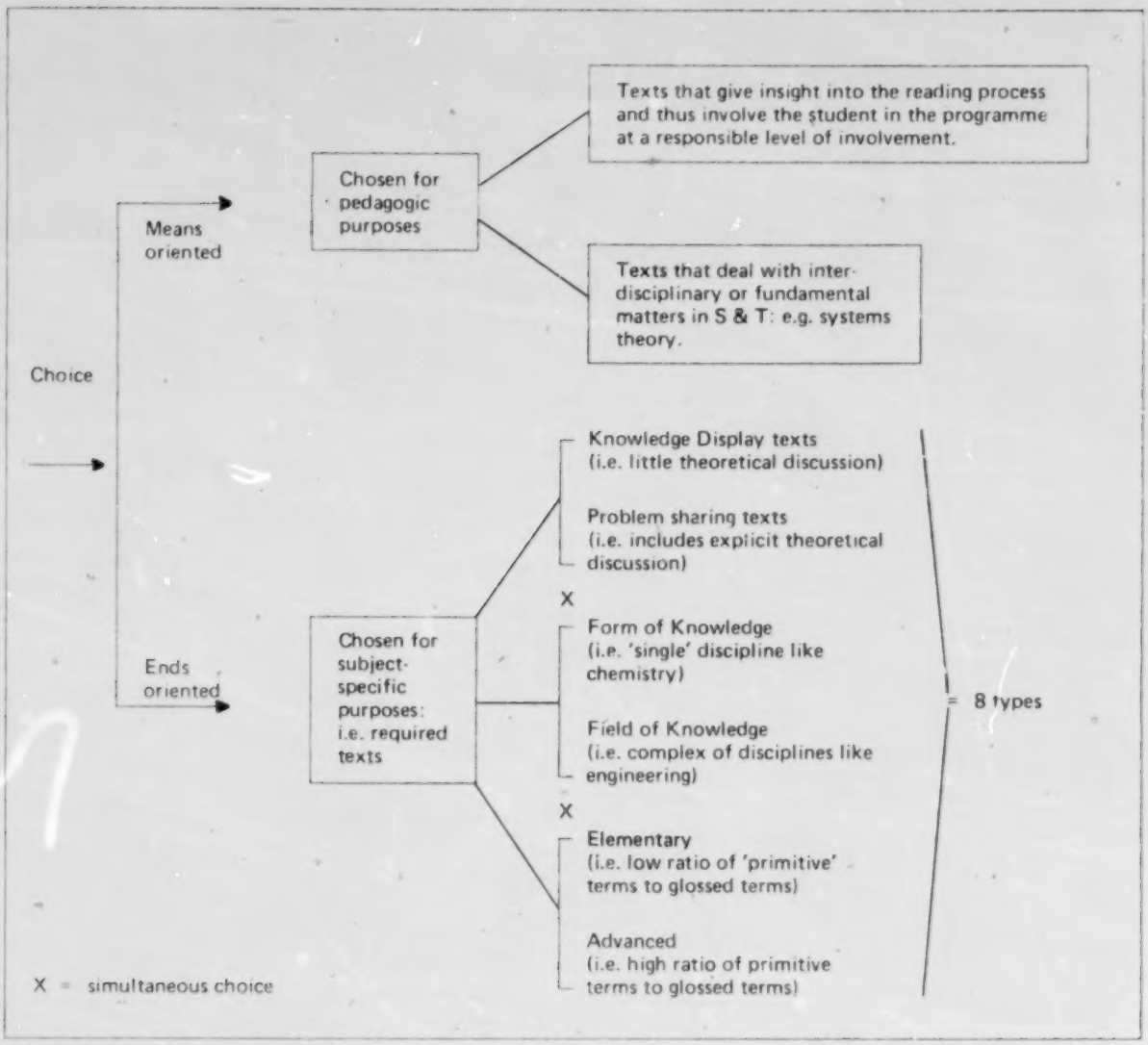
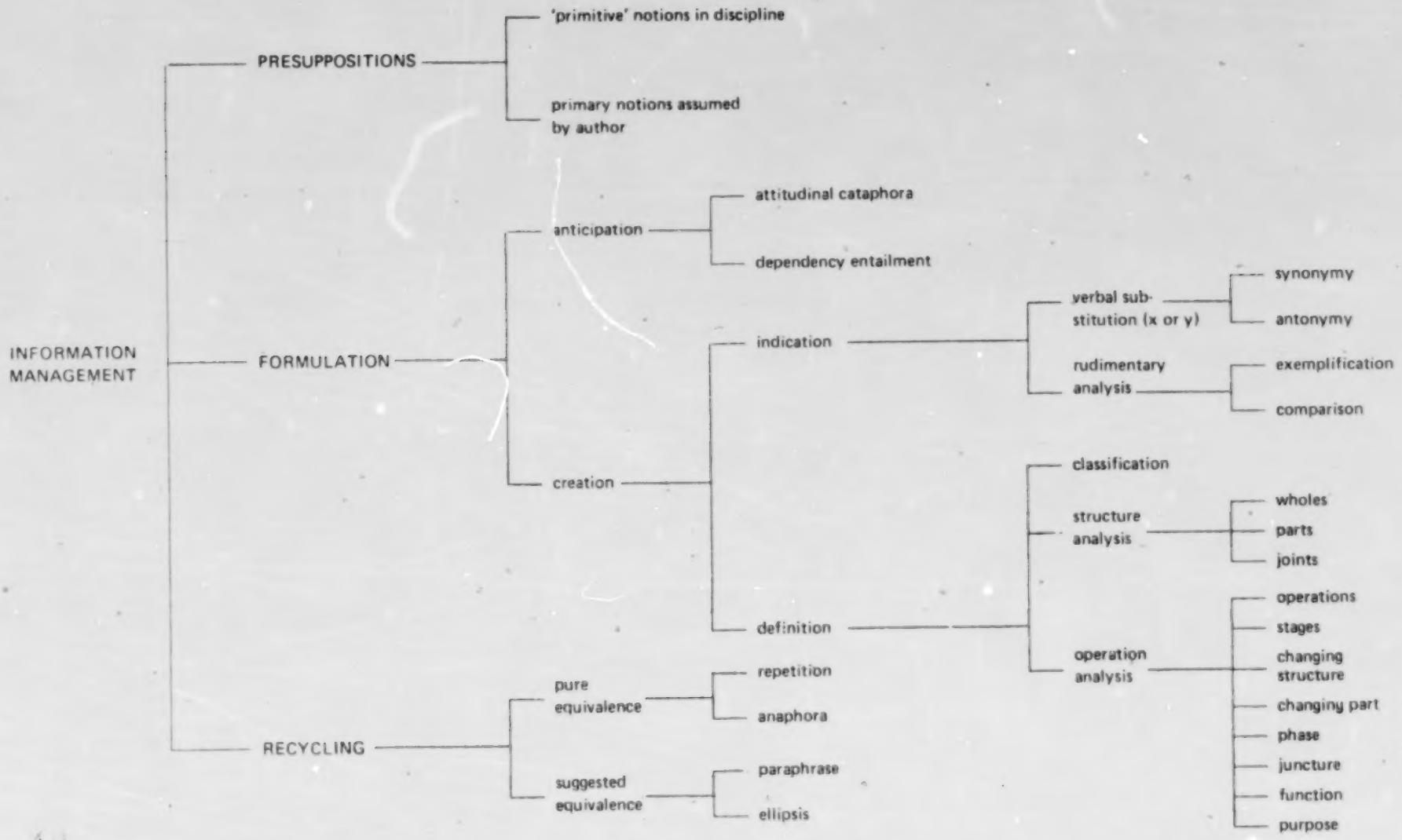

Choice
Means oriented
Ends oriented
Chosen for pedagogic purposes
Texts that give insight into the reading process and thus involve the student in the programme at a responsible level of involvement.
Texts that deal with inter-disciplinary or fundamental matters in S & T: e.g. systems theory.
Chosen for subject-specific purposes: i.e. required texts
Knowledge Display texts (i.e. little theoretical discussion)
Problem sharing texts (i.e. includes explicit theoretical discussion)
X
Form of Knowledge (i.e. 'single' discipline like chemistry)
Field of Knowledge (i.e. complex of disciplines like engineering)
X
Elementary (i.e. low ratio of 'primitive' terms to glossed terms)
Advanced (i.e. high ratio of primitive terms to glossed terms)
= 8 types
X = simultaneous choice

DIAGRAM 14

INFORMATION MANAGEMENT OPTIONS



Appendix 2

SYSTEMS CLASSIFICATIONS

1. Boulding's classification

1.1 The first level is that of static structure. It might be called the level of frameworks: for example, the anatomy of the universe.

1.2 The next level is that of the simple dynamic system with predetermined necessary motions. This might be called the level of clockworks.

1.3 The control mechanism or cybernetic system, which might be nicknamed the level of the thermostat. The system is self-regulating in maintaining equilibrium.

1.4 The fourth level is that of the 'open system', or self-maintaining structure. This is the level at which life begins to differentiate from non-life: it might be called the level of the cell.

1.5 The next level might be called the genetic-societal level; it is typified by the plant, and it dominates the empirical world of the botanist.

1.6 The animal system level is characterised by increased mobility, teleological behaviour and self-awareness.

1.7 The next level is the human level, that is, the individual human being considered as a system with self-awareness and the ability to utilise language and symbolism.

1.8 The social system or systems of human organisation constitute the next level, with the consideration of the content and meaning of messages, the nature and dimensions of value systems, the transcription of images to historical record, the subtle symbolisation of art, music and poetry, and the complex gamut of human emotion.

1.9 Transcendental systems complete the classification of levels. These are the ultimates and absolutes and the inescapable unknowables, and they also exhibit systematic structure and relationship.

2. Jones classification

	Kind of system and its mode of operation	Components	Couplings between components	Examples
1	Manual system Operator-directed, flexible	hand tools or aids	one human operator	cook plus utensils, craftsman plus tools, singer plus amplifying equipment
2	Mechanised system System-directed, rigid	powered mechanical sub-systems	on-line human operators, tracks, conduits, etc	railway system, assembly line
3	Automatic system Pre-set programmed or adaptive	powered mechanical sub-systems	cables, pipes, conduits, levers, etc, forming a control circuit	clock, process plant, telephone exchange, digital computer
4	Collaborative man-machine system Exploratory and flexible	one or more human operators, one or more complete automatic systems	complex displays and controls	multiple-access computers
5	Mechanical sub-system Operator controlled and inflexible	highly interdependent physical parts forming indistinguishable components and couplings		engine, automobile, machine tool
6	Administrative system Goal directed and hierarchical	human operatives with tools or aids	rules, messages, human administrators and informal contacts	army of foot soldiers, a business, a school
7	Voluntary system Self-rewarding and collaborative	any number of persons each of whom is also a biological system and some of whom also act as administrative sub-systems	affection, shares aims, laws, customs, managers, physical presence, mutual aid, common language, ancestry, etc	family, religious order, club, society, (university?)
8	Environmental system Permissive of a range of human activities and contacts, prohibitive of others	inhabitants and facilities within an environment, the outside world	spaces and the barriers between and around the components	occupied building, city or region
9	Biological system Homeostatic, adaptive, evolutionary, growing, differentiating and self-reproducing	cells, organs, sub-systems, all of which are also physical systems	nerves, glands, chromosomes, etc, past experience and environment	cells, plants, animals, 'human operators'
10	Physical system Dynamically stable but subject to eventual decay	elementary particles, planets, seas, land, etc	gravitation, electrical forces, radiation, physical motions and forces	solar system, molecule, crystal, cloud, strut, tie, beam, shell
11	Symbol system Semantic, analogous ambiguous or precise	words, signs, symbols, numbers, etc	syntactical rules	languages, mathematics, codes, etc

Systems classified according to mode of operation and the physical nature of their components and couplings.

TEACHING ENGLISH FOR SCIENCE AND TECHNOLOGY:
The Specialised Training of Teachers and Programme Organisers

J R Ewer

Background

The teaching of English for scientific, technological and technical purposes, though of comparatively recent growth as a specialised activity, is now emerging as one of the most rapidly expanding and important branches of TEFL/TESL today, as is reflected in the growing number of conferences, seminars and articles devoted to the subject and the rapid growth of EST programmes throughout the world. At the same time, considerable difficulties are being experienced in putting these programmes into effective operation on the scale required; difficulties, moreover, which are likely to increase rather than diminish in the immediate future.

There are several reasons for this situation, but the crucial one is the almost total lack of teachers trained to undertake this work. Thus although in many parts of the world the institutions engaged in the training of scientists and technologists (or in the actual application of science and technology) are taking the English-language courses out of the hands of the ELT institutions because of the latter's failure to provide the kind of instruction required, and in growing measure are setting up their own English-teaching centres in the hope that they will be able to develop more relevant programmes, these initiatives are bound to have only limited success inasmuch as they are at present dependent upon exactly the same sort of teacher as those who have failed in the first place to meet the demands made upon them. This in turn is because teacher-training institutions everywhere are not only neglecting to provide the special training which is imperative if this type of English is to be taught successfully, but do not as yet recognise that such a need exists. Our first step must therefore be to examine briefly the main circumstances under which EST is being taught at present, and the ways in which these make novel demands on the staff which are not catered for in the present teacher-training courses. This procedure will also provide an indication of the size of the problem.

There are three main situations in which the attempt to teach EST is being made. In the first of these, the scientific subjects themselves are taught in English from the beginning of the school course, in common with the rest of the curriculum. The countries falling into this pattern are mostly ex-British or American territories in Anglophone Africa, the Pacific and the Caribbean who have retained English as the medium of instruction, often because they comprise highly fractionised multi-lingual communities for which an educational **lingua franca** is an obvious necessity. It might be supposed that in these cases the basic problem has been solved, and that a student of science or technology, having completed his school courses in English, would then proceed to university or technical college fully equipped to cope with the English of his professional training and subsequent career. However, this is not so for reasons which it is unnecessary to explore at length here, but which may be largely accounted for by the large-scale withdrawal of expatriate teachers, the rapid expansion in school populations, and the fact that the language of school textbook and classroom differs markedly from that of genuine scientific communication at a professional level. Even in these countries, therefore, it has been found necessary to introduce EST courses into the programmes of tertiary-education establishments[1]. The second pattern is to be found in large areas of Europe, Latin America and the Middle and Far East, where although school instruction is given in languages other than English, EST is needed at tertiary-education and on-the-job level, and where there is also a growing tendency for it to be introduced into the last year of the school course. Finally, the teaching of EST takes place in the principal English-speaking countries themselves in an effort to ensure that the many scores of thousands of non-English-speaking students of science and technology, who arrive in these countries annually to follow tertiary-level courses or undertake research, know enough of the right sort of English to enable them to carry out their assignments successfully.

From the foregoing it is clear that the strategic point in the teaching of EST is the specialised programme at the post-school stage. But although this has the advantage that it is also the most economical in terms of resources required, it has to be emphasised that the world-wide population potentially affected is to be counted in hundreds of thousands, if not millions[2]. Even at this restricted level, therefore, the demand now and for the immediate future poses a formidable problem whose solution is becoming rapidly more difficult with every month's delay on the part of those responsible for teacher-training.

Apart from the factor of the scale of operations indicated by the preceding analysis, the very nature and constraints of the teaching of EST at tertiary or late-secondary level give rise to a series of difficulties for the teacher who finds himself involved in this activity, for which his previous training will not only have done little to prepare him[3], but will contain elements which actually add to his problems. It should perhaps at this point be remembered that the vast majority of EST teachers are not, and will not be, native-English speakers themselves, though it should also be stated that in our experience the following remarks apply almost equally to the native-speaker as well.

From ELT to EST: The Teacher's Difficulties

The EFL/ESL teacher who turns to the teaching of EST finds that his difficulties fall broadly into five categories – attitudinal, conceptual, linguistic, methodological and organisational: From the attitudinal point of view his previous career is likely to have been almost entirely literary-oriented; his main intellectual contacts will have been with people whose enthusiasms and values have been formed in a rather narrow humanistic tradition centring round history and literature. For this and a number of other reasons – ignorance of science breeding fear and distrust, the generally defensive posture of the humanities in recent years, almost certainly a socio-economic discrimination in his own country against arts students as compared with science students, etc – he is likely to have acquired an anti-science bias, overt or covert. This is a very serious barrier to effective teaching in an EST programme, since it cannot be concealed from the students and leads to an attitude of mutual distrust which is fatal to the whole enterprise; equally, it tends to inhibit the teacher himself from making the necessary efforts to overcome his other difficulties.

Since his previous education has done little to prepare him to understand science and how it is used, his conceptual knowledge will be inadequate for his teaching needs: this is particularly true for teachers from less-developed countries where the division between the 'two cultures' in formal education is still sharply-defined and where extra-curricular means of bridging the gap, such as a widely-accessible 'quality' press, radio and TV, are lacking. Yet it is obvious that a sympathetic understanding of what science and technology are about, their aims, methods and potentialities, as well as a broad working knowledge of the key concepts of the main specialities, must be an essential part of the successful EST teacher's equipment.

From the linguistic point of view the non-English-speaking teacher of English will have been rather poorly trained for teaching the special varieties of the language with which EST is concerned. First of all, the inevitable gaps in specialised lexis will constitute a very appreciable further-learning problem which, unexpectedly perhaps, is far greater in size and degree of difficulty for a teacher than for his students. This is for three reasons: (a) the teacher will need to know the basic lexis of a wide range of different specialities, whereas each group of his students will be concerned with only a limited number of inter-related ones; (b) the students (but not the teacher) will already be acquainted with many items since they will be similar in form to their vernacular equivalents; (c) the teacher will in many cases have to learn the concept as well as its linguistic form. Another problem for the teacher is that even the comparatively small number of items which comprise the 'core-language' of science and technology (ie those of high frequency and wide range over all disciplines) are likely to contain numerous difficulties, and a fair amount of further acquaintance with these features will usually be necessary before his control of this type of English is consolidated[4].

As regards teaching methods, there are again important differences in attitudes and classroom practices between those of the conventional EFL/ESL course and those required in the teaching of EST. In the first place, account has to be taken of the dissimilarities in the students concerned. In terms of numbers and resources employed, the main teaching effort of the school course is concentrated on children of the ages 12–14, and the teacher-training courses therefore tend to devote much of their psychological and methodological instruction to the problems of this group. EST, on the other hand, is primarily directed to late adolescents and adults of the age-range 17–22 and above, whose interests, motivation and intellectual and emotional maturity are very different from those of the school group; this requires the teacher to make correspondingly large adjustments in the approach and classroom methods he adopts. Similarly, many of the traditional language problems of the school course (reported speech, question-tags, polite forms, R.P., many intonational features, etc) are entirely irrelevant to the EST situation; yet without special training it is extremely difficult for the conventional EFL/ESL teacher to avoid wasting valuable time trying to teach such points – in which he himself may have achieved a painfully acquired

competence – or insisting on totally unnecessary 'remedial' work. Another point relates to teaching materials and programme design. Whereas for the school programme a wealth of material, however aimless, is readily available, whilst the programmes themselves are frequently so stable as to be hallowed by the tradition of decades, for the EST programme the teacher will find no such well-trodden highway to follow; and although the situation as regards the supply of materials for EST is now much improved compared to even five years ago, he will at the very least have to know how to evaluate, select and adapt existing materials to the needs of his students, and may well find himself in a position where he will have to produce entirely new ones. Essential as these activities are, they do not normally form part of the teacher-trainees' basic course of studies, and indeed are usually absent in any realistic sense even from the postgraduate TEFL courses. Finally, the absence of any real-life aims in the majority of school courses, their lack of any meaningful standard of evaluation except artificial ones often supplied solely by the course-teachers themselves, and the combination of generous time-allocation and low efficiency-expectations which they enjoy[5], all constitute a situation which is diametrically opposed to that of the teaching of EST, where the task is strictly practical, has to be completed within quite circumscribed time-limits, and its results are pragmatically measurable by the students. Hence the teacher coming from the school or 'general' EFL/ESL course to an EST programme is required to make what is virtually a psychological somersault, and this is far from easy in the absence of clearly directed training.

Lastly, there is the altogether unaccustomed and unforeseen area of difficulties which teachers are now having to face, viz that of having to be responsible for organising and running what for them is a new type of ELT programme and one which to an increasing degree is administratively independent of the teacher's 'home' institution. This necessarily involves them in problems of student job-analysis, curriculum development, time-tabling, budgeting, man-management, infrastructural organisation (the provision of books, AVA, clerical facilities, etc) and intra- and inter-institutional liaison for which their training has given them neither the knowledge nor – equally important – the mental toughening-up necessary[6].

Teacher-training for EST: The Chilean Experience

Given the general accuracy of the foregoing analysis, it is relatively easy to map out a training programme which should at least reduce the teachers' difficulties to manageable in-service proportions and lead to a substantial improvement in the efficiency of EST courses. Clearly a seminar of a few days or a week is quite inadequate (though this is seldom recognised to begin with): nothing less than a properly-organised course lasting a hundred or more hours will in most cases enable the practising teacher or trainee to acquire the extra skills he needs and to learn to discard those he does not. Such a course has in fact been developed over the last few years at the Department of English of the University of Chile at Santiago as the major component[7] of its EST teacher-training programme, and other universities in the country have introduced similar schemes. It forms part of the normal undergraduate syllabus[8] and in its present version lasts 120 class-hours. Its main features are briefly as follows:

For descriptive purposes it can conveniently if arbitrarily be divided into four areas corresponding roughly to different overall objectives which are developed both sequentially and concurrently in order to involve the students in an interlocking and mutually illuminating structure of activities. The first of these is concerned with filling in the students' conceptual vacuum. Although this is being done throughout the length of the course as a consequence of the various activities themselves, an immediate attack on the problem is made through a pre-course reading assignment of two general background books, one on the scope of modern technology and the other on how scientists actually work, based on the case study approach. The assignment is accompanied by roneoed sheets of questions designed to direct the students' attention to key points in each book and to get them to think about what they are reading. During the course itself this general conceptual background is amplified by selective reading on science and technology, by visits to scientific and technological institutions, by carefully selected films followed by discussions and projects, and by the compilation by each student of a portfolio of informative material and visual aids on chosen aspects of science and technology, taken from both English-language and vernacular sources. The portfolios are also used in the teaching methods part of the course and afterwards serve as useful teaching aids during the students' own teaching careers. This section of the course takes up 20–25% of the total time.

The second area consists of an introduction to the special language-features of EST. Instruction here is based on an examination and analysis of actual scientific texts and on selected material from EST

textbooks and locally produced materials. In addition to training in certain syntactical features which are poorly dealt with in the standard ELT courses (see Note 4), and some of the more unfamiliar lexical items of the core-language of EST, it includes symbols and abbreviations, 'instructional' English[9], some key items of specialised lexis from a sample of selected disciplines, and an introduction to 'idea-following' exercises[10] and written and oral note-taking[11]. This part of the course occupies about 35% of the time and also reinforces both the first area (conceptual background) and the third (methodology).

The third area deals with some of the factors which affect the methodology of teaching EST in various circumstances and is carried out partly through lectures and demonstrations, partly through micro-teaching; it includes such aspects as attitudes towards 'errors', the use of AVA, testing, speed-reading and the production of materials. It finishes with a short period of class-observation and practice teaching in a full class of EST students and accounts for another 20% of the course.

The last area is devoted to a brief consideration of how to organise and administer an EST programme. It includes the examination and evaluation of teaching materials, programme analysis, modular programming[12], time-allocation, budgeting[13] and staff-management, and takes up the remaining 20% or so of the time.

Whilst it is not possible in the limited space of this article to describe in detail the methodology employed in teaching this course, one or two practices and principles may be worth mentioning. One of the first points to emerge from the earlier and shorter versions of the course was the necessity of having enough time to enable the students both to overcome their initial fear of science and to absorb the many novel aspects of this type of teaching without undue pressure; in particular, to develop the realisation that they were not only perfectly capable of understanding very broadly what the main branches of science were about and how the scientific and technological mind worked, but that this could be an interesting and enjoyable activity in itself[14].

By the same token, the attitude of the course-instructors is of fundamental importance: it must be relaxed, patient and reassuring. They must insist, time and again, that they are prepared to explain anything any number of times, or to get students who have grasped a given idea to explain it to those who have not. In our own case, a positive point has been that the instructors emphasise that they are not experts themselves and may not be able to answer every question raised; however, they also add that they will find out, and explain to the students **how** they have found out – indeed, one of the aims of the course is to acquaint the student with sources of information and train him to use them.

In the section of the course which deals with administrative skills, a series of simulation problems in staff deployment, programming and budgeting are given, with the students working out solutions in 'syndicates' of three or four. These problems are based on real-life local cases and the exercise as a whole thus not only increases the confidence of the students in their ability to tackle this kind of work but underlines its relevance.

Microteaching and actual classroom teaching practice are in our view essential aspects of the course but may lead to a possible encroachment on the functions of another department or institution at times. Close cooperation in such circumstances is indispensable, and in our own case the willing assent and encouragement of our colleagues of the EFL Methodology and Teaching Practice section of the Faculty of Education has been a major factor in the smooth implementation of this part of the course.

Conclusions

It is not suggested that the course outlined above is the complete answer to specialised training for teachers of EST – its intention is rather to provide a sound basis for self-improvement, and in any case needs to be supplemented by seminars and inter-institutional staff attachments, as indicated in Note 7 – or the only one. On the other hand, to get any such programme into operation demands a supply of reasonably skilled instructors, and in the absence of local teachers who have already had experience in the teaching of EST successfully these will for the present be hard to find[15]. That this unfortunate situation has arisen is largely due to the virtual neglect of this speciality by the postgraduate ELT institutions, particularly those in the English speaking countries themselves. Parallel therefore to the type of course we have just been discussing, which is intended primarily for undergraduate teacher-trainees or as a retraining course for teachers in service, there is an urgent need for effective EST instruction in postgraduate courses, and it is hoped that this will be provided without further delay.

Finally, it may be appropriate to say a word about self-instructional materials for EST. The very large number of students affected and the present serious shortage of trained teachers for this area must lead one automatically to consider whether the provision of s.i.m. is not likely to be the best solution to the problem. There are, however, at least two serious impediments here. The first is that it is very difficult to obtain practical training in the techniques of producing these materials, since the upsurge in interest in this field which occurred in the '60s as a result of the general shortage of teachers in the Western world has now subsided; the second, and on the whole weightier, factor is that their production in the bulk and variety now required demands extremely large amounts of time and (in the case of possible AV- or computer-aided programmes) equally large amounts of money. It is certainly to be hoped that these difficulties will be solved in time; meanwhile the immediate and serious situation has to be faced. From this angle, the provision of relatively short training/retraining programmes, which will enable the practising ELT teacher or trainee to make the best use of the rapidly-growing amount of conventional materials now being produces for EST, seems to be the most practicable answer. But the time for action is now.

Notes

1 Wingard, pp 53–4. Similar situations to the one described by Wingard in Zambia are reported from ESL countries as far apart as Nigeria, India and Fiji (personal communications).

2 From the indications available, about 70% of entrants to tertiary education in most parts of the world are now following studies in science and technology (including in these categories the social sciences and business management). Assuming that EST programmes are to be made available to only ¼ of these students for only $^1/_3$ of their courses, the numbers affected run well into seven figures annually – and this excludes further large numbers engaged in vocational (technical) education and taking on-the-job courses. Although such estimates are necessarily only approximate, they at least give an idea of the order of magnitude in play.

3 Ewer & Latorre p 228; Ewer & Hughes-Davies 1972 pp 270–2; Strevens 1972 p 8; Swales pp 9–12.

4 Ewer & Latorre p 225 and Ewer & Hughes-Davies 1971 p 67 indicate some of the discrepancies between the core-language of science and the contents of typical 'general' ELT courses widely used in the training of non-English-speaking teachers. In commenting on similar discrepancies, Strevens (1971 pp 8–9) makes the point that even where correspondences exist the transfer of linguistic learning from a non-science context to an EST one is likely to be incomplete.

5 In Chile, for example, the school ELT course is allocated more than 600 hours, at the end of which 80–90% of candidates fail the (at present) unrealistically easy exemption examinations of the university science departments. The university EST programmes, on the other hand, are allotted only about 90 hours as an average, though there is now a welcome tendency for this to be extended to the 130–140 hours which is considered to be the minimum required.

6 One of the most interesting and challenging aspects of tertiary-level EST programmes is the possibility they offer of breaking with established traditions and hierarchies. One factor in this is that expansion is becoming so rapid in some parts of the world that one out of every three or four teachers entering the field can expect to be immediately appointed a programme supervisor or assistant supervisor; another is that there is a marked tendency for new programmes to move away from the traditional ELT institutions and come under the wing of the science departments, who are much better off financially but expect the EST staff to run their own affairs efficiently in all respects.

7 For a brief description of earlier versions of the course, see Boys. Training is also carried out by means of seminars and staff attachments. Seminars last from two to five days and have so far been held for the purpose of giving practising teachers a general idea of the nature and scope of EST; as expertise becomes generalised, workshop-seminars of similar length will need to be arranged to discuss particular aspects of EST teaching such as programming, testing, AVA and research. Attachments of staff-members from the less developed EST institutions to the more developed ones have proved to be stimulating to both parties: to be effective, these should be 1–3 weeks in length – a visit of a day or two is of little use.

8 And is thus compulsory for all students. Hitherto the course has been spread over an academic year, as is the usual practice for University courses. In 1975 it was reprogrammed as an intensive course of 15 hours a week for eight weeks, thus enabling practising teachers from the rest of the country and abroad to attend.

9 Ewer & Hughes-Davies, 1974, pp 19–24.

10 Ewer (a).

11 Ewer (c), pp 41–9.

12 Ewer (b).

13 Ewer (d), pp 24–27.

14 One of the interesting sidelights on the programme has been that students regularly make the comment that if they had had a similar course at school, or on entering the university, they would have chosen a scientific career instead of English. One should not overlook the fact that a proportion of students choose Arts subjects (including English) for negative reasons and have been put off science at school for quite fortuitous reasons – there may well be many a scientist manqué in the ranks of EFL/ESL teachers!

15 Regional centres such as RELC, CIEL, the Indian Institutes and ELTI, which are able to draw on the resources of a wide area, clearly have a major part to play in offering a speedy solution to this problem.

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DEVELOPING STUDY SKILLS IN ENGLISH

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A. Historical Background

1. Traditionally, ELT materials have been based on an inventory of grammatical structures, the signification of which has been brought home to the learner through a selection of situational context contexts, and the learning of which has been achieved through a battery of drills and exercises. The selection of grammatical structures for the most part rested on ad hoc assumptions about frequency and difficulty, while the selection of lexis in part depended on the situational contexts chosen to provide a setting for the massive practice of the structure under discussion, and partly upon non-registerially defined word-counts. There have been recently a number of criticisms of this approach to syllabus design from a number of standpoints (Allen and Widdowson 1973; Widdowson 1971; Candlin 1972, 1973; Wilkins 1972; Kirkwood 1973; Jakobovits 1968; Palmer 1970). In essence what these writers are doing is to raise objections to defining units of learning – 'learning items' – in grammatical terms. They argue that linguistic progression, such as is found in an analytical grammar of a language, is not to be equated with the psycholinguistic progression appropriate to a set of course materials intended to develop in the learner a growing ability to 'use' the language pragmatically. This leads them to resist equating linguistic 'difficulty' with learning 'difficulty' and to raise objections to the assumption, often tacit in course materials, that it is possible in some globally applicable way to assert that some structures will be needed before others, and that there is thus an ordained pattern of grading. It would seem, too, from research into error analysis, that the way learners modify, extend or restrict the range of their perceived rules of the language being learned, argues strongly against syntax being acquired in some linear bit-by-bit accretion. (For further discussion of this point see Righter and Moore 1973; Richards 1974; Ravern 1974).
In classroom terms the inflexibility of this 'whole grammatical system' approach arguably affects motivation negatively, and it is a frequent complaint that 'situations' chosen not to highlight role and status differences in the use of language but merely to offer opportunity for the repeated display of particular grammatical structures have produced a low return in terms of out-of-class usability. Perhaps even more importantly, recent writers have raised objections to the lack of depth in terms of layers of meaning handled by these structural-situational materials. Stimulated by a switch of concentration in theoretical linguistics from the study of syntax to the study of semantics and sociolinguistic concern with the nature of communicative competence (Hymes 1972) they argue that it is only by observing language in use by particular learners and how it reflects both the deep structure semantic links between sentences of heterogeneous surface structure and the nature of connected discourse that one can bring into materials the pragmatic values of everyday talk.
We shall explore later this distinction between 'semantic' and 'pragmatic', but in essence to the question: **What is the structural form of sentence X?** has to be added the supplementary: **What communicative value does sentence X have as one or more utterances?** A concentration on language in social interaction involves an examination of the speaker's intention and the hearer's response; as such it requires analysis of implication and communicative strategy which goes beyond surface structure and beyond the boundary of traditional language learning 'situations'.

2. If one now looks at the field of specialist ELT, with which this paper is concerned, a similar change of attitude to that of ELT in general is clear. Early and global attempts to handle the 'English of Science' went very little further than fitting a generally and non-subject-specific 'technical' lexis to a similar range of structure as was available in the non-technical general course. Under the impact of the notion of 'register' (itself defined, as Widdowson 1973 points out in essentially linguistic terms of grammatical structures and 'specialist' lexis) and based on empirical research into the structures and vocabulary of technical texts (Huddleston, Hudson, Winter and Henrici 1968; Ewer and Hughes-Davies 1971), materials were developed which indicated in a most useful way the lexical and structural identity of a variety of sub-branches of science and technology. Although, as is pointed out in Corder (1973), such differences in structure as were enumerated were fewer than one might have at the outset imagined, it was clear that EST (English for Science and Technology) materials could no longer merely replace 'orange' by 'Bunsen burner' in the 'This is a' structure of Lesson One. A similar shift of emphasis from form to functional value to that noted above, and under the same influences, involved materials-writers in analysis of specialist English in terms of the concepts portrayed by sequences of language in text. In addition to noting formal

structure, writers (like Strevens 1971, Allen and Widdowson 1973, Kirkwood 1973, and Candlin 1974) emphasise the way in which language is used to exemplify certain common reasoning and conceptual processes of science, such as defining, classifying, spatial and temporal relations etc. Rather than looking at the formal register of scientific writing as merely a collection of specialist lexis and structure, materials-writers have to take account of the way such processes are expounded in rhetorical patterns in scientific discourse.

Furthermore, it may be possible, at least in the numerate sciences, if not the social sciences, to demonstrate that these reasoning processes are common to the scientific and technical stock-in-trade of speakers of a variety of languages, rather than being viewed, like grammatical structures, as something novel. Without ignoring the problems of Whorfism, and accepting that investigation is needed to determine in a given case whether the learning blockage stems from a deficiency in reasoning by the learner or insufficient linguistic resource, it may be the case in teaching EST that one is indeed involving specialist learners in performing in the target language those mental processes and intellectual operations already familiar to them from their 'doing science' in their mother tongue. As Selinker and Trimble (1972) point out:

> 'Generally, foreign language learning is considered as subject matter, with no specific goal for using the language. We . . . cannot take that position at all . . . Our students are learning a foreign language primarily in order to manipulate difficult intellectual material in it.'

3. We have indicated above a gradual movement in both general and specialist course design away from an exclusive emphasis on the formal structure of sentences towards a portrayal of the communicative value of utterances in discourse. We have implied that present approaches to relating linguistic theory to language teaching are less dogmatic than in the recent past. That is, although fundamental criticisms are being offered about particular language-teaching methodologies and about the linguistic and psychological assumptions underlying such methodologies, a common approach is to draw more freely from whatever body of knowledge seems to offer insights to developing in the learner that competence which enables him to produce utterances which are grammatical in the purely linguistic sense and to structure utterances in ways appropriate to the expression of chosen communicative values in particular settings and encounters.

In this section we concentrate on a three-part foundation for the **Study Skills in English** case-study in the light of this shift of emphasis. We look, in turn, at an EST view of meaning, of grammar and of the communicative concepts of science.

B. Theoretical Background

1. Meaning

We referred in the introductory section to a reorientation of teaching materials, including EST, to a concentration on meaning, rather than exclusively on linguistic form exemplified in isolated sentences. One can (following Leech and Svartvik 1975, Candlin 1975, Widdowson 1973, 1974 and Wilkins 1972), usefully for EST, look at meaning as operating at a number of levels such that a string of lexical items has a layered structure of latent meaning. Strings of language are multivalent, and communicative competence rests on a capacity to decipher levels of meaning, peeled off, as it were, from the formal object. Let us assume that our object is a string of lexical items taken from a text in which the author is concerned to put across his personal opinions, and in particular his qualified agreement:

> 'This seems acceptable but we must take X into account.'

For this or any other such string of language we could firstly peel off a layer of meaning which has to do with the basic semantic categories of a grammar (Wilkins's logico-grammatical categories, for example – see Wilkins 1972 and section 3.2 below) where we examine how **Time, Manner, Number, Quantity, Place** are expounded. We note indefinite and future **Time**, we note particular **Quantity** and so on. This **notional** level of meaning is of course commonplace to ELT materials, with, however, the important difference indicated above, that under such headings are now contained various syntactic structures sharing that notional meaning: the data are reorganised.

If one strips off a further layer, what one might call a layer of **propositional** or **referential** meaning (what Austin (1962) called the 'locutionary force' of an utterance), this string of lexical items is valued for its objective propositional content: (we-necessity-take into account-X) asserted by a speaker and open to confirmation or denial by reference to known experience, viewed objectively. At this level of meaning, utterances have a literal value. In terms of textbooks, an interrogative **structure** means a **question**, a declarative **structure** means a **statement**, and so on.

If, however, we return to the original string in the text and see it in the context of an expression of opinion by a particular Speaker/Writer with particular Listener/Hearers in mind, a **pragmatic** or **sociolinguistic** meaning (Austin's illocutionary force) is suggested whereby this string has the value of **qualified agreement.** At this level, strings have the value of indicating personal attitudes or of directing the behaviour of interlocutors (hearers or readers). Here interrogatives are not necessarily questions, nor are declaratives statements.

Up to this point we have concentrated on meaning looked at as a property of single strings. Since language occurs in connected sequences, strings need also to have a **meaning in context** identified: what could be called **contextual meaning.** At this level one examines how strings pattern together in sequences and how any one such string has a value in relation to what it presupposes and what it entails. Widdowson (1973) makes a crucial distinction here when he refers to the way strings interconnect and cohere grammatically in formal terms (see our earlier remarks on formal definitions of 'register'), a **textual** view, and the way in functional terms strings are looked at as exponents of communicative concepts such as reports, classifications, hypotheses etc, a **discoursal view.** Looking at this level of meaning concerned with connected text more deeply, it is clear that just as in conversation there are distinct patterns which can be isolated; for example, how individuals open and close talk, how they interrupt, how they force repetitions of information and the like (Sinclair, Coulthard et al 1974, Schegloff 1968, Jefferson 1972) – so in written texts, including EST texts, repetitive rhetorical patterns can be observed: a proposition opens, is exemplified with evidence, the evidence is estimated, a counter-proposition is forestalled, further exemplification is given, an opinion (overt or covert, tentative or direct) is delivered, and a conclusion drawn. It is, then, part of the meaning of a string how it relates formally and functionally to the other strings in the text which contains it.

In the case of the example above, the **this** and the **X** have contextual meaning in the **textual** sense in that the string is inexplicable without anaphoric reference, while the entire string has contextual meaning in the **discoursal** sense in that it exemplifies the giving of a tentative opinion after the citing of evidence and before the drawing of a conclusion. It has a particular place within the pattern of the exchange of information and attitude within the whole context, ie the article in this case.

Learners of language and EST learners in particular, have to decode strings at all layers of meaning; one cannot only look at EST in terms of particular grammatical structures fleshed out with technical vocabulary or look only at the way sentences cohere textually in a context; each sentence has to be evaluated in terms of its propositional and pragmatic value and the way it suggests a place in the argument of the discourse.

2. Grammar

An audience in an EST course at postgraduate level presents certain significant differences from initial learners at school, especially in regard to the teaching of grammar. Such a student is a learner in transition not a novice, between English seen as a formal system to be learned through illustrative drill or grammar translation techniques and English seen as a communicative medium for the expression of concepts and verbal purposes through which complex intellectual material has to be grasped, assessed and reacted to. What is essentially a remedial operation does not involve a faster run over the isolated syntactic structures of the typical secondary course; on the contrary, at our level the learner has to become involved in a sorting process whereby he begins to associate together the surface-structure heterogeneity of schoolbook patterns under, for example, the kinds of logico-grammatical category (outlined in Wilkins 1972). Under **Time**, for example, can be grouped not only tense exponents but also sentences in a paragraph in so far as they all serve to indicate temporal relations. The learner has to put his syntactic stock under semantic headings, associating, let us say, a range of **possibility** expressions (possibly, may, could, might, maybe, perhaps, it is possible that etc), themselves learned for their forms' sake at widely different stages in a traditional structural course

under a single conceptual head. This is, then, a central **organisational** principle. It clearly involves also an equally significant principle of **choice**, whereby sociolinguistic criteria of role, audience and channel determine which of the semantically available exponents is to be employed in this organisational sense; they are not sociolinguistically equivalent in the sense of implying identical criteria of choice.

A pedagogical implication of this for the typical EST learner is that he is involved in handling at least partly known data; to be sure, formal error still exists, and the job of a course like **Study Skills in English** is to extend his range of exponents under typically met-with sociolinguistic constraints, but this is for him a redirecting operation rather than a totally novel one.

One danger, however, lies in wait. This is to imagine that the learning of however finely tuned a set of sociolinguistically differentiated exponents of a single semantic concept is equivalent to understanding and 'knowing' in a generative sense the relations between grammatical form and our multi-layered meaning. One cannot replace insights into the practical realisation of grammatical structure which enables the learner to generate his own utterances with memorising the idioms of a phrase book. Building up that knowledge in productive and receptive terms involves greater understanding than the learning of idiomatic lists implies. Achieving that competence involves at least the following aspects of grammar:

1. The learner needs to be aware of grammar in **categorial** terms; ie he has to be aware of word-classes and slots in structure. Part of his grammatical knowledge involves handling the labelled bracketing of sentences. He needs this knowledge so that inter-sententially, as Allen (1973) documents, he can have a clear understanding of the structure of the English noun-phrase and verb phrase, and be able to 'block off' syntactically lengthy and disjunctive sequences for sectional decoding.

2. Equally, as Corder (1973) makes clear, he has to be aware of the ways English can express grammatical **processes** such as passivisation, relativisation, nominalisation and thematisation. He needs this knowledge not only so that he can see deep-structure semantic equivalences among heterogeneous surface structures such as the following:

   a. It has been government policy to preserve monopoly in the agricultural sector.

   b. Preserving monopoly has been the government policy in the agricultural sector.

   c. What the government policy in the agricultural sector has been is to preserve monopoly.

   d. It is in the agricultural sector that it has been government policy to preserve monopoly.

   but also so that he can choose among them according to which of the units of information in the sentence he wishes to raise to prominence. Encoding or decoding sentences in a text involves this awareness of the sentence as a bearer of information (Halliday 1970) made plain through the grammatical processes indicated here.

3. Finally, he is concerned not so much with producing and understanding sentences as with the processing and production of connected texts. As such he has to have a knowledge of the intra-sentential function of grammar so that he can control the cohesive devices of **text** and employ the grammatical processes of (2) above to indicate the value of utterances in **discourse**.

The implication in pedagogic terms of the aspects of grammar listed above is that we are not merely concerned with allowing the learner to exemplify a linguistic structure such as 'subject – verb – object – adverbial clause of manner' but to express in an appropriate way what **he** wants to say. Such a view involves a departure, as we have indicated, from those courses which are based on the twin concepts of **linguistic** structures graded in an assumed ascending order of difficulty and practice in exemplification. The problem about minimising randomness in relation to linguistic structures (the purpose of grading) is that it leads to a maximisation of situational randomness. Our need was precisely the opposite. We needed to minimise **situational** randomness. We started therefore from the position of deciding not 'what structures do we need to teach and how will we grade and sequence them' but

rather 'what situations will our learners be required to perform in' and 'what structures will they need?', or, more precisely, 'what do they need to do with English, and what structures do they need for doing it?'

As will be seen later, the specification of the content of a language course based on this concept of grammar required us not merely to select exponents of particular grammatical structures but also to select a range of specific activities. The 'linguistic content' of the course, then, was seen as inseparable from the 'activities content'. This is an important point. Traditionally the 'linguistic content' is selected first, then graded and 'situationalised'. Activities are seen as a series of operations which can be carried out on particular sequences of linguistic data. In our course, 'activities' and 'linguistic content' were perceived to be directly interrelated.

3. The Communicative Concepts of Science

As a third foundation for **Study Skills in English** we have referred to the conceptual techniques used by science to talk about its subject matter. Writers (like Strevens 1971, Widdowson 1973, Candlin 1974, and Williams 1973) make the point that the practice of science involves processes such as giving directions, describing, generalising, exemplifying, evaluating, quantifying, differentiating, concluding etc, which are in themselves a definition of the activities of the scientist. To be a scientist for example is to be engaged in these and similar patterns of thought. Williams (1973) outlines a possible taxonomy:

Identification	involving	defining questioning
Classifying		taxonomy matching differentiating
Analysing		evaluating generalising measuring simplifying concluding testing predicting
Process		interaction causality change of state
Describing		evidence inference hypothesis states processes quantification explanation instruction

Bearing in mind that such a taxonomy could be made up for any branch of intellectual activity and therefore that for any particular specialist learner considerable selection would be necessary, we can point to these patterns of thought as a central input to EST materials. Our initial assumption is that we are not involved in teaching the patterns of thought but rather extending the ability of the student of science to communicate them in English. Just as in our comments on **Grammar** above we suggested that at the level of Study Skills part of the task was a reorganisational one, so here we lay claim to the student's professional competence and in language teaching involve him in procedures with which he may be already familiar. Once again it is clear that the task is not (Williams 1973) 'grafting special lexis on to laymen's language' but designing a course to develop recognition and production abilities in verbal and non-verbal modes for well-known techniques. One then comes to

define the language of science in terms of communicative concepts and then to examine the formal ways in which, speciality for speciality, these concepts are expounded in oral and written texts.

An important corollary to the emphasis on the procedures of the scientist, and a general principle in specialist courses, is that the manipulation of the procedures themselves in the foreign language extends the learner's competence as a scientist. Currently there is a significant emphasis among secondary schoolchildren which stresses the involvement of the young learner in developing his own logical control and communicative ability in language in general through the medium of a foreign language. In a similar way, the student of Study Skills working with the language of the operations of science within the themes of his own speciality may well be involved in a process which has wider educational value than merely assigning new labels to old concepts.

C. Study Skills Analysis and Course Design

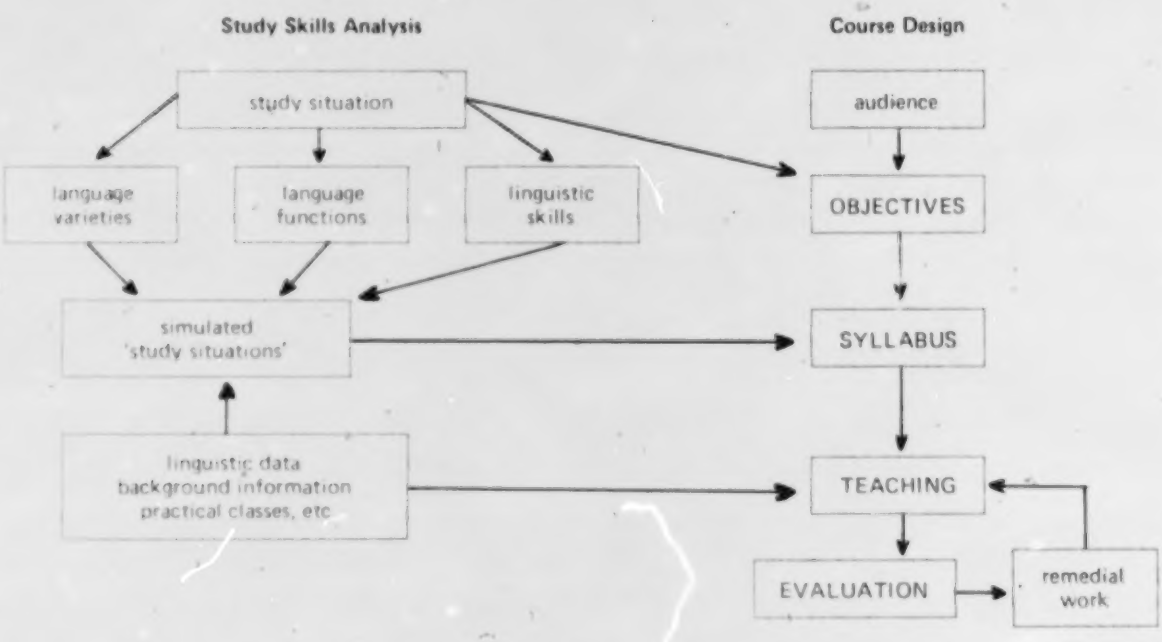

Figure 1

Notes:

i. The objectives are governed by our knowledge of the audience and our research into the nature of study skills.

ii. The syllabus is determined by our analysis of the various combinations of skills which are employed in specific situations, and the linguistic content is determined by the varieties of language which manifest themselves in specific specialist fields.

iii. The mode of teaching is determined by the nature of the simulated 'study situations' in relation to particular types of pre-activity preparation.

iv. Evaluation provides two types of feedback:

a. in terms of remedial requirements
b. in terms of design faults.

1. Study skills analysis

We began our analysis by collecting as much information as we could about the background of our audience and the types of postgraduate study in which they would be engaging in this country. The manpower and material resources at our disposal determined the possible scope of our activities, and we informed the British Council that we could take 40 students and run four specialist groups. The final choice of subject area was determined on the basis of data supplied by the British Council

in terms of the distribution of foreign students over a range of specialisms. From this information it seemed sensible to concentrate on **Engineering, Economics, Urban Planning** and what became known as **Foreign Service**, a term for the training undertaken by overseas postgraduate students who were embarking on a career in the Foreign Service of their respective countries. Having chosen the subject areas, we then requested the British Council to send us only those students who were going to study in one of these fields.

After we had determined our subject areas, we set out to obtain as much information as we could about the type of course students would be taking in this country, at what institutions, and for what length of time. We wrote to the institutions concerned for information on course structures, modes of teaching and set reading lists. On the basis of this information we were able to assemble a picture of the types of study situation our students would find themselves in and the types of activities in which they would have to engage.

We discovered that most of our students would be in this country for at least one and possibly two academic years. In most cases the terminal award would be a master's degree. The mode of instruction in most cases would be a combination of lecture, seminar and tutorial. It was assumed that each student would naturally engage in a great deal of private study.

Our next step was to analyse these various modes of instruction and private study in terms of the particular skills and combination of skills which the students would have to employ, and to produce an inventory. Figure 2 illustrates the macro-skills and combination of macro-skills under each mode heading:

MODE	Lecture	Seminar	Tutorial	Private Study
SKILLS	a. Listening Comprehension b. Note-taking c. Ordering points in a hierarchy of importance	a. Listening Comprehension b. Note-taking c. Oral delivery from notes/ without notes	a. Listening Comprehension b. Note-taking c. Oral-delivery from notes/ without notes	a. Reading Comprehension b. Note-taking c. Ordering of points in hierarchy of importance d. Formal (academic) writing, report writing

Figure 2

Each of these 'macro' skills was further analysed into 'micro' skills to produce data which would allow us to plan the activities of our course. There is not space here to reproduce the full inventory. However, we can give an example. **Reading comprehension** is understood as a generic term for a range of different types of reading skill or, alternatively, a set of reading strategies. We differentiated for our purposes between two basic strategies, one for skimming purposes and for obtaining an overview or gist of a body of written material, one for intensive study of highly complex data. Both strategies we regarded as being extremely important, although we spent perhaps more time on the latter. We spent much time trying to analyse what the reader must be able to do when seeking to assimilate a body of written data. We have established (Section B above) that it is not enough simply to 'understand' the meaning of a text in terms of its syntax and lexis. In addition it is necessary to understand the **significance** of a text. The student must be able to do more than simply analyse the semantic and syntactic interrelationships in a text. He must be able to say that 'This text means X' but also to ask questions of the order of 'Is this text significant for me?', 'Is it important?', 'What points are of primary interest?', 'What are secondary?', 'Is this fact or opinion?', 'Is this argument tendentious?', 'Is this hypothesis well founded?' and so on. In other

words we regarded the macro skill 'Reading' as consisting of a dynamic attack on a given text, during which it is subjected to a range of questions posed by the reader.

The same approach was adopted for the other macro skills. 'Listening comprehension' was thus a convenient label for a range used to which students would put their knowledge of the language while they were 'listening' to it. Again, a list of micro skills was produced: the student would have to be able to analyse the incoming information in relation to specific needs of his own and to formulate questions such as 'What is the significance of this message?', 'Is the speaker giving me facts or opinions?', 'Can I accept this argument?', 'How does this information relate to my own opinion?', and so on. In other words, we assumed that in both reading and 'listening' the student would be processing data and analysing them in relation to his own knowledge of the subject matter of the written or spoken text. On every occasion he would have to be aware of the 'significance' of the text as well as its 'meaning'.

Of equal importance was the fact that in any one 'learning situation', whether in a lecture or seminar or when engaging in private study, the student would be called upon to draw simultaneously on a range of skills, and not just one in isolation. In a seminar, for example, he would need not only to listen to what was said, but also to respond to questions, initiate discussions, challenge points of view, take notes of important points, perhaps use written notes as a basis for elaborating orally on a particular topic. This fact has important implications for our later decisions about the design and content of the course itself.

2. Questions of Course Design

Our decisions on the design and content of the course were governed to a large extent by the following factors:

1. Our knowledge of the intended audience in terms of their previous English language learning and proposed field of study.
2. The time at our disposal (three weeks).
3. Our concept of 'grammar'.
4. Our analysis of the study situations which our students would encounter.

One of our chief problems, to which we have yet to find a really satisfactory solution, relates primarily to the first of these four factors. We assumed that our audience would have completed a course in English as a foreign, or indeed second, language and would have a firm grasp of English sentence structure. It was our intention to use this level of proficiency as a basis for advanced work not on English 'grammar' but on the use of English for particular (study) purposes. In fact we discovered that, although many students had been tested in their command of English at their respective home institutions, not a few who had attained an 'advanced' level skill made many 'grammatical' errors when called upon to produce English utterances. This situation has happened every year since the course was first mounted and the intractable problem has been the integration of an efficient remedial programme into the mainstream course which takes it for granted that the students can handle structures accurately. We are aware, therefore, that more work needs to be done by everyone concerned in the selection of students for this course. Another possibility is that we may indeed have reached the point where we might have to consider that the English Study Skills course is perhaps aimed at an ideal audience which in fact does not exist.

Clearly the second factor listed above exerts a grave constraint on the design and content of the course. Basically the question is: what can one hope to achieve in the three weeks? We decided that in terms of a measurable improvement in the performance of students we could not hope to achieve very much. However, we considered that the following aims were both desirable in principle and realisable in practice:

i. to give students maximum insight into the nature of the uses which they would require to make of their knowledge of the English language

ii. to give them as much awareness as possible of their own individual problems and areas of weakness, help them to diagnose their own long-term needs and provide them with structures for systematic and profitable self-study

iii. to give them as much practice as possible in performing in simulated study situations using English.

Aims i. and ii. we regarded as being of fundamental importance. We decided that if the student could be made maximally aware of what was in store for him during the period of his studies in this country he would then have a much clearer idea of what his own particular needs were likely to be at a time when he could still consult with the course tutors. He would thus be able to use his time to the best advantages when he was on his own.

The time factor together with our decision that the course should be 'activities-based' rather than 'structure-based' and our knowledge of the specialisms of our students provided us with criteria for decisions about the means of realising the above aims. We made three basic decisions:

i. the activities should be seen to be relevant to the student's future language needs

ii. the activities should be seen to be interrelated and mutually motivated

iii. the number of activities should be limited and practised cyclically.

We may now move to a description in some detail of two of the boxes in the **Course Design** flowchart, namely [syllabus] and [teaching].

3. Syllabus

Drawing up a detailed timetable/syllabus for the course was not easy. Firstly we established the main components of the course and then considered the nature of the various activities which belonged to each component. Finally we constructed a highly integrated, not to say intricate programme. What follows now is a statement of the main components with the activities listed under each heading.

A. Specialised Topic Groups

These corresponded to the four major fields of postgraduate study, namely Economic/Business Studies, Foreign Service/International Relations, Engineering, Planning. Specialist topic group activities took up by far the major part of the course. Each group took part in a number of different types of session, namely:

1. Seminar sessions: reading comprehension and associated exercises.
2. Language laboratory sessions: note-taking, close listening exercises, pair-work.
3. Televised seminar sessions: two sessions on specialised topics led by staff from the particular disciplines.
4. Project and case-study sessions: problem-solving 'games'.

Details of some of these sessions are given in the next section of this paper.

B. Remedial Groups

Here students were allocated to groups on the basis of types of learners' error and not in terms of their specialist field of study.

C. Individual Tutorial Sessions

This type of session allowed tutors to discuss the problems of individual students, to hand back work, and to give advice.

D. Assignments

Students were expected to do a considerable amount of private work, much of which was essential for later class work.

E. Orientation Sessions

These formed a 2½-day block at the beginning of the course and served to introduce students to the type of activities they would be engaged in during the main course.

F. General Lecture Sessions

Our major design problem was to integrate these different sessions in such a way that the activities of each were motivated by preceding activities and functioned as preparation for later activities. Here is a schematised version of one strand in the course.

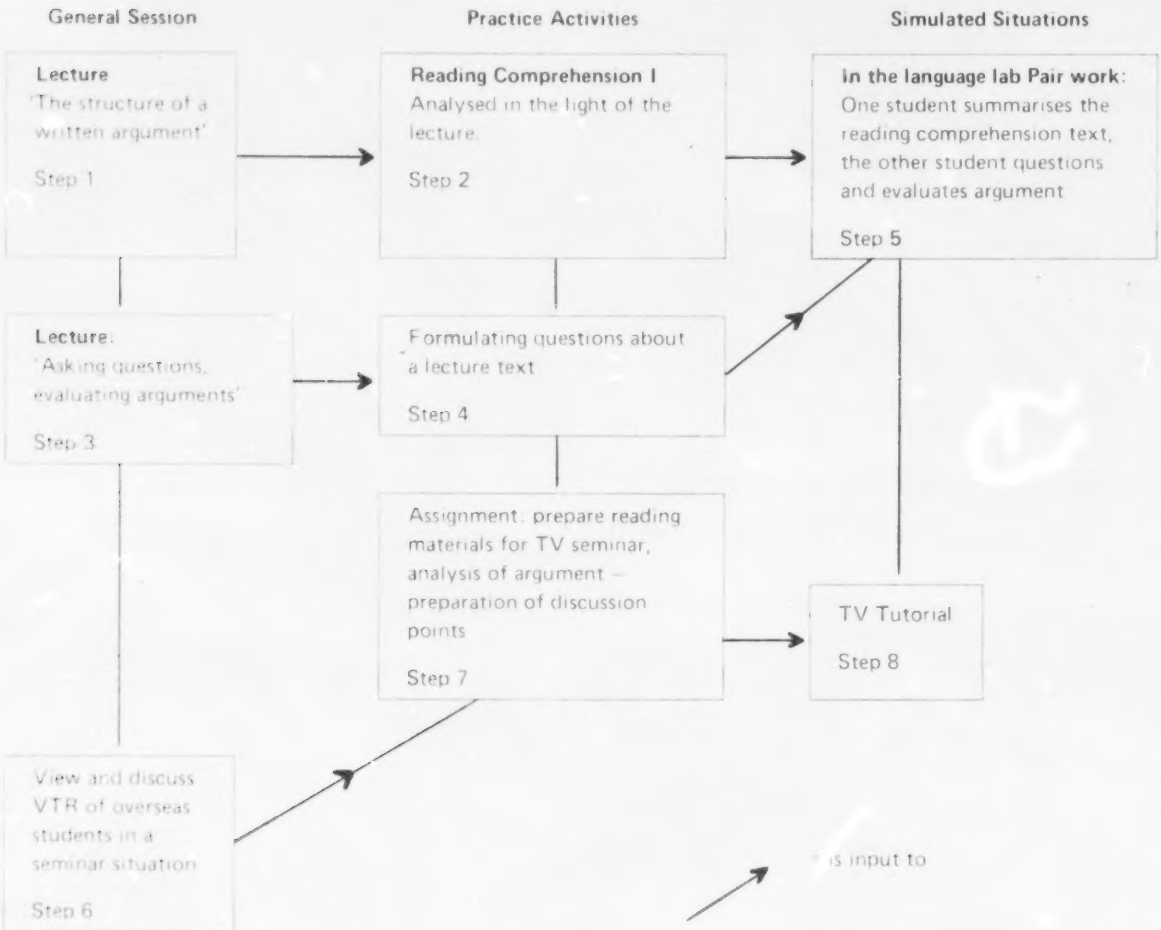
General Session
Practice Activities
Simulated Situations
Lecture
'The structure of a written argument'
Step 1
Reading Comprehension I
Analysed in the light of the lecture.
Step 2
In the language lab Pair work:
One student summarises the reading comprehension text, the other student questions and evaluates argument
Step 5
Lecture:
'Asking questions, evaluating arguments'
Step 3
Formulating questions about a lecture text
Step 4
Assignment: prepare reading materials for TV seminar, analysis of argument – preparation of discussion points
Step 7
TV Tutorial
Step 8
View and discuss VTR of overseas students in a seminar situation
Step 6
is input to

Figure 3

As can be seen from the above chart of interlocking events, students were required to carry out a range of different types of activity. These activities are at least as significant a part of the syllabus as the 'linguistic' content. As was stated above, we decided from the beginning that it was not enough merely to provide students with examples of English used for scientific or specialist purposes but that it was equally essential that students practise the activities which would be required of them later on. In this way they would immediately be placed in the position of actually having to use English as opposed to merely analysing it or carrying out stereotyped 'language classroom' operations on exemplifications of English structure.

It is clear that producing a timetable for the total course was a very complicated task, since the integration exemplified above had to be sustained to the end of the three-week course. The advantages of such an integrated programme are that, firstly, each session is motivated by sessions which preceded it and serves as an input to later sessions. The relevance of each session is consequently clear to the students. Secondly, the cyclic nature of the course permits the repetition of a series of activities while permitting variation in the teaching materials.

Unfortunately there are also disadvantages. Firstly, flexibility is reduced significantly, since it is difficult to change one part of the course without having to carry out a series of consequent changes in the remainder of the programme. Secondly, it is easy for students to become confused unless the structure of the course is explained carefully and in detail before the course begins. To this end we introduced this year for the first time a 2½-day 'orientation session' in order that the students could have time to study the design of the course and to practice some of the activities which would recur regularly during the course itself.

In this discussion of the syllabus so far we have been discussing the design of the course and the types of activities which students are required to perform. We must now discuss the 'linguistic' content of the syllabus.

The principle guiding our choice of data is quite simple. In every case we use 'real' data which we then modify for particular purposes. Details of examples of some of these modifications are given in the next section of the article. We have found that there is little, if any, published ELT material which can be used on a course of this type. Either the style of examples of, say, 'scientific' English has been of doubtful validity or the subject matter has been at best of tangential interest and usually far too elementary in terms of its content. We decided to acquire our data from 'source' as it were and collected as many texts as necessary from books and articles which the students will have to read during their postgraduate courses. Audio-material in every case consists of actual lectures given by specialists to final-year or postgraduate courses. This decision to use nothing but real data results in a considerable amount of organisational work and is totally dependent on the goodwill of lecturers in the specialist departments concerned. We are glad to take the opportunity here to record our extreme gratitude to all our colleagues at Lancaster who have contributed material for our courses over the last few years. Without their help, our task would have been exceedingly difficult.

4. Teaching

The teaching methods are best described in relation to the four main components of the course, namely **general sessions, practice activities, simulated situations** and **remedial sessions.**

General Sessions

In earlier versions of **Study Skills in English** general sessions played a much more important role than they do in our latest version, namely **Study Skills in English 1974.**

Originally general sessions took the form of lectures to the whole audience. These lectures were of two types. Firstly, some of the lectures dealt with aspects of language function. Secondly, there were lectures on various points of formal grammar. Examples of lecture titles of the first type include:

a. Asking Questions in Seminars
b. Focussing Information and Attention
c. Logico-grammatical Categories I
d. Logico-grammatical Categories II
e. Categories of Communicative Function

Lectures of the second type include:

a. The Syntax of Time and Aspect
b. Specification
c. Modality
d. Temporal/Locational Relations

All the lectures were accompanied by quite substantial handouts which were distributed to students. These handouts consisted basically of lists of exemplications of the subject of the lecture and were designed to provide the student with information which he could use later on after the course. The

handouts also served as reference lists during practical sessions in that students were asked to find examples in texts of the various logico-grammatical categories, functions and syntactic structures discussed in lectures. They were also expected to consult these handouts when writing their assignments.

It was as a result of our experience with these handouts in group session work that we decided that the lectures were not in fact very successful. We found when we tried to analyse texts according to various logico-grammatical, functional and grammatical headings that in fact many of our categories were either too vague or were pseudo-categories or that categories overlapped considerably. In short, we were faced with the fact that language is multifunctional and that attempts to dissect it into discrete functional categories, while perhaps theoretically desirable, lead to large problems when attempts are made to measure actual utterances against only one functional heading. Our students did not seem able to tackle these problems successfully.

We decided therefore to reduce drastically the number of general sessions in 1974, allowing as a consequence considerably more time for practice activities in specialist groups.

Practice Activities

These are of two basic types:

a. those relating to the analysis of discourse;

b. those relating to specific simulated situations.

Teaching in this context is best described as organising and monitoring. There was little overt teaching. Students were asked to read specialist texts or listen to excerpts from specialist lectures and to carry out a series of operations ranging from comprehension questions of the 'what is the passage about' type to analysing the devices in written and spoken English for focussing the attention of the reader/listener on those parts of the discourse regarded by the writer/speaker as being particularly important. A range of these exercises is given in the next section of this paper.

Simulated Situations

These fall into three categories:

a. lectures on specialist topics;

b. 'pair-work' (ie students working in pairs) on the content of these lectures – generally involving oral summary, question-answer, argument, etc;

c. televised seminars on specialist topics.

Again, teaching in the sense of presenting new information played little part in these activities. Students worked on prepared materials, whether tapes or texts,and specific tasks were worked out by tutors before the course began. The most important function was monitoring performance, and here both tutor and students were heavily involved. This was particularly true of c. These seminars were recorded on video-tape and played back afterwards in order that students could have an opportunity to assess their own performance and to discuss with tutors particular aspects of the seminar situation.

Remedial Sessions

Here teaching was much more conventional and followed the pattern of presentation of information, with consolidation by means of exercise and evaluation of the degree to which students had assimilated the new material.

These sessions were organised not according to specialism but in relation to specific grammatical topics. Ideally they should have been sessions which were organised to deal with specific problems experienced by individual students. This would require, firstly, a very reliable diagnostic test; secondly, a large battery of differentiated self-instructional learning packages arranged in terms of grammatical point and specific linguistic skill; and, thirdly, multi-media facilities with individual study carrels. None of these three requirements can be met at the present time.

In earlier years we tried to react 'on the spot' when we became aware of these problems which our students had not solved before coming to Lancaster. It was not possible however to produce

effective remedial programmes on the spot, mainly because of shortage of manpower and the lack of packaged remedial teaching materials. Recently we attempted to predict the remedial needs of students and employed two members of staff to produce a programme of remedial English which was interwoven with the main course from the beginning. This has been a reasonably satisfactory solution from an administrative point of view, but we have yet to solve the problem of reacting sufficiently quickly and effectively to learning problems which come to light in the main part of the course. If a student as a result of doing a piece of written work, for example, asks for a remedial class on a problem which we have not 'predicted', our solution tends to be of a rather ad hoc nature and consequently possibly not as effective as it might have been if we had had more notice. In short, we are conscious of a rather serious lack of 'back-up' facilities, which is a function rather of lack of finance than of anything else. Lancaster University does not mount any EFL or ESL courses, and consequently the course is short of a bank of remedial teaching materials.

We need to say a word about the **case-studies** which each specialist group carried out during the course. These were particularised projects involving teamwork and the use of real data to solve real problems. The work was monitored by a specialist in the given field and the projects and the data were provided by the respective specialist department.

These case studies were not simulated situations – they were real in the sense that there were real problems to be solved, and they could only be solved on a team basis. Consequently the use of English for specific communicative purposes was absolutely motivated by the need to achieve particular goals. Student interest and motivation were well stimulated by these case-studies and we regard them as a very successful component of the course as a whole. Details of these case studies are as follows:

1974	Group A:	A role-playing case study: a company merger. (Economists)
	Group B:	Simulation of a British Cabinet meeting. (Foreign Service)
	Group C:	A case study of electricity supply in a remote valley area. (Engineers)
	Group D:	A case study of regional planning and the issues involved. (Planners)

D. Some Sample Materials

On page 59, a schematised version of one strand of the course was given. As an illustration of our methodology, some discussion follows of what constitutes the practice activity **Reading Comprehension I** for the specialist topic group **Foreign Service.**

1. Reading Comprehension Exercise

The students were each given copies of an article which had been set as preliminary reading for a tutorial they would later have with an outside tutor in their own specialist area. Accompanying the article was a set of comprehension questions divided into two sections: Section A, which aimed to develop skimming skills, and Section B, intended as a deep reading exercise (see above, page 56). The students were instructed to read through the Section A questions before starting the passage and to ask for clarification if the questions were not clear to them. The questions were simple True/False questions and could be answered with a fairly superficial reading of the passage; most of them fall within the category of 'literal' questions as proposed by the Barrett taxonomy. The title of the passage was also discussed.

Pre reading and discussion of the Section A questions and the title of the article aimed to develop in students a sense of reading for a specific purpose. They were instructed to read the passage as quickly as possible, simply looking for the answers to the questions and nothing else, ie their task was to find out whether the passage substantiated or denied a number of statements. This replicated as closely as possible one of the main reasons for which students might wish to use skimming techniques. It was also often necessary to give some brief instruction regarding the avoidance of vocalisation and the possibility of increasing eye span width. It must be admitted that training students in skimming techniques was very difficult, especially at our level and with the type of text difficulty they encountered; the students tended to be perfectionists and the prose was often turgid. In our experience it took a great deal of practice and a good deal of 'moralising' on the tutor's part to persuade students that it was not a crime to subject a text to one's own purpose, ie to read it to extract simply the information that one wanted from it.

Having completed and corrected Section A (the faster students correcting themselves by re-reading the text), the student began Section B: deep reading. The questions in this section utilised the Barrett taxonomy and ideas from McKay and Mountford (1972) in their design.

2. Paraphrase Exercises

The third step (usually a separate session) was what we loosely termed 'paraphrase'. This could focus on any of the areas discussed in section B1–3 above (pp 51–55). To give an example, the following sentence might form the basis of discussion:

> Even if both dogma and growing power should push Peking toward a global role, given its internal problems the transition will be long, and China is bound to remain in the meantime a potential super-power, ie a major player presently limited in scope but exerting considerable power globally.
>
> (Stanley Hoffman: "Weighing the Balance of Power" in **Foreign Affairs** Vol 5 July 1972, p 620.)

Questions which relate to intra-sentential function and NP/VP unity (see Section B2 above) are as follows:

1. At what point in the sentence would you divide it in two?
2. Taking part 1:
   a. At what point would you divide it in two?
   b. Where would you make another division?
   c. What is the main clause?
   d. What structures introduce the sub-clause?
   e. Make up a sentence using the first sub-clause marker plus a main clause.
   f. Make up a sentence using the second sub-clause plus a main clause.
   g. Make up two sentences of the same type as d. and e. with different sub-clause markers.
   h. Make up two sentences with the same meaning as d. and e. but with different structures.
3. From 'a major player . . .' to the end:
   a. What points in the sentence can be expanded using **which**?
   b. What other words have to be added if **which** is used?

A syntactic/semantic paraphrase question:

4. Re-express the following phrases, keeping the meaning the same but changing the structure if necessary:

   push Peking towards a global role

   the transition will be long

   in the meantime

   is bound to remain

   presently limited in scope

   exerting considerable attraction

These questions can hardly claim to be revolutionary: their main claim is that they relate to structural and semantic problems that the student is going to have to face in this and similar texts. They are aimed at presenting the student with a strategy for dealing with complex syntax as well as at bringing to light the particular problems posed by this specific sentence. Presented as they are above, they appear rather bald. In fact, they represented a strategy for class discussion rather than a set exercise which the student had to work through on his own. Question 2 (f) for example, gave rise to considerable discussion and experimentation towards the precise structural and semantic function of **given** as a subordinator: What was its logico-semantic function? Could it be replaced by other subordinators syntactically/semantically? Similarly, Question 4 raised problems of audience, role and channel for discussion.

3. Vocabulary Extension

An exercise which concentrated on building up vocabulary and, very importantly, collocations is as follows:

(the text to which these questions relate is omitted for reasons of space; however, it is hoped that their purpose will still be clear)

1. a. What nouns in this passage are related in meaning to the noun **model** as it is used here?

   (Expected answers:
   design, blueprint, system, policy, structure)

   b. What verbs are used with these nouns? eg 'the model **moderated** . . . the accomplishments of rulers'. Give other examples in this way.

   (Probable answers:
   the blueprint is inspired . . . the past
   the model restrained violence
   the model provided flexibility
   is in favour
   is tempting
   the system is coming to an end
   . . . etc)

   c. Use the word **model** in a sentence of your own on this topic.

2. a. Pick out all the words and phrases in paragraph 3 that have to do with types of relationship between states.

   (Probable answers:
   balance-of-power
   a contest of actors
   ambitions . . . have to be contained
   by the power of other states equilibrium
   fixed blocs
   . . . etc)

   b. Use one of these words/phrases in a sentence of your own on the same topic.

The main problem with these types of question was that they did not provide the student with enough opportunity for practising the structures and lexis discussed. This problem could be complicated by differing ability levels within a class. In this case we were confronted with what we have described above as the problem of reacting sufficiently quickly and effectively to learning difficulties. This could be solved by building up a bank of supplementary exercises, but as yet time and manpower have precluded this.

A further difficulty is also evident: it was easy for the student to do well in a class run on the above lines and yet retain very little at the end. So far, we have given insufficient attention to follow-up from one lesson to the next. This problem could be fairly easily overcome by giving short and frequent tests.

4. Discoursal Exercises

It will be noted that **Reading Comprehension I** is preceded by a lecture on 'The Structure of Written Argument' (p 59). A handout exemplifying and expanding the points made regarding discoursal meaning accompanied the lecture and was applied to the reading text. Exercises which concentrated on discoursal meaning were of the following general type:

1. Students label sentences or parts of sentences according to headings such as **hypothesis, qualification, exemplification** etc.

II. Students provide explicit linguistic markers for the rhetorical patterns to be found in a text.

III. Students underline topic sentences.

IV. Students sum up each paragraph of a passage in a sentence or phrase and then rewrite their summary in a connected paragraph.

5. Questioning Strategies

Reading Comprehension I was followed by a lecture 'On Asking Questions and Evaluating Arguments'. The points covered in this lecture were applied in a later case (see Step 4 of diagram, page 15) and again as part of the preparation for a language laboratory session. The following assignment exercise based on **Reading Comprehension I** is set as preparation for the language laboratory and also indirectly for the TV tutorial:

1. Imagine that, after reading this article, you were to have a seminar with the writer:

   a. Make up one question for paragraphs 2–8 that you would like to ask him.

   b. After you have made up these questions, refer to the handout 'On Asking Questions'. What is the function of each of the questions you have made up?

   c. Use the examples given in the handout to make up one question for paragraphs 9–17.

   d. Use the examples in the handout to make up one more question for paragraphs 2–8. The function can be the same as your original question, but the way you express it must be different.

2. Tomorrow, in the language lab, you will have an opportunity to discuss this article with a colleague:

   a. List five topics you think might be discussed with your colleague.

   b. Formulate a question to put to your colleague about each of these topics.

   c. What is the function of the questions you have formulated?

   d. Make up two more questions with a function different from those you have already formulated.

This exercise was designed not only to sharpen the students' critical abilities but also to highlight the way in which role relationships can affect both the function and formulation of questions. The exercise moves from a fairly straightforward imaginary situation where the student probes the writer about what he had written (here one expects the student to be largely concentrating on making his doubts and criticisms of the article explicit) to a more complex activity: the student probes a fellow-student about his reactions to what they have both read. In shifting from the first situation to the second (and one supposes that the student would initially regard this as a relatively trivial change), the student should become aware of a shift in style and function; that is, of how doubts and criticisms can be formulated differently.

6. Pairwork Exercises (Language Laboratory)

It might be of interest to give a few details regarding the language laboratory activity to which the above exercise (together with a summary exercise) acted as input. In the language laboratory the student tape recorders were adapted to allow two students to record on one tape deck. (Many modern laboratories have this facility; failing this, junction boxes can be made up fairly easily.) The students' brief was a suitably elaborated version of that given on page 59 (Step 5). They discussed for five minutes or longer, wound back and monitored what they had done, making a critical appraisal of their discussion and questioning techniques together with the tutor (see above, page 61). This kind of work has proved to be an extremely valuable follow-up to reading and written work in that it has provided students with a context in which they have had to draw extensively on material (and therefore lexis and probably structures and rhetorical techniques) which they had met in their reading. As a language laboratory exercise, pairwork has the advantage

of involving all students simultaneously in discussion: no one can opt out, as is possible in class discussion. This type of exercise requires skilful, efficient and intensive monitoring by the tutor and some experience in phasing each pair's rewind and monitor steps; also students need to be encouraged to be critical of themselves and each other. (Eg the tutor monitors something that fairly obviously requires comment; the students pass it by; the tutor stops the tape, elicits rather than directly makes the comment, and then says something to the effect of 'Well, why didn't you stop the tape and discuss this yourselves?'; he then lies in wait for the students to pass something else by, and repeats the same performance. In other words, the tutor's technique is to make it obvious to the students that part of the activity is self-monitoring.) A further advantage of this type of activity, in terms of the course structure, is that all students had a chance to discuss the topic, before the TV tutorial class and should therefore have felt reasonably familiar with the topic and how it might be discussed.

E. Conclusion

In the light of our experience with the course over several years, we believe that it does meet, however imperfectly, the real needs of the students for whom it is designed. We are aware, however, of several problems which must be solved before we would claim more in terms of the success of the course than we do at the moment. In relation to the three key variables (the course itself, the audience and the time at our disposal) we believe that the design of the course is basically adequate, given that the competence of the audience for whom it is written meets the assumptions of the course designers. Even if the audience in terms of their command of English are less competent than is assumed by the course, we believe that the design is still adequate if the timescale is extended considerably beyond three weeks.

Having said this, however, we feel that we would need to re-evaluate the objectives if we had to assume that the duration of the course would always be three to three-and-a-half weeks and that the audience would continue to include a reasonably large group of members who had failed to reach that command of English which is taken for granted as the basis from which work during the course can proceed.

Since it is likely that future timescales will be the same as before and that the audience will not change radically (although we always hope that a way will be found to select students more delicately than is the case at present), it is the objectives themselves which will probably change.

How the objectives will be redefined is a question which has yet to be discussed. At this stage, however, we can give some idea of the likely direction by listing in summary form the points we shall have to consider seriously.

We shall have to simplify the structure by reducing the range of activities, concentrating perhaps more on the need to improve the reading and writing skills of our audience. In particular we are worried about the extent to which 'errors' in student work cannot always be classified easily in relation to obvious 'points of grammar'. Very often they can be (however crudely), but often students produce 'stylistic infelicities' which reflect a lack of precision in their modes of thought — ie they produce written and/or spoken utterances which are either illogical or else vague and unclear. We shall need, therefore, to think more about the relationship between linguistic skills and thinking.

Also we shall need to watch that the 'grammar' component of the course does not become merely a sophisticated 'phrasebook'. In other words, while we believe that the quest for stylistic variants in relation to communicative purposes is a valid objective, we must be careful to include instruction in the linguistic code which will allow students to **construct** their own utterances rather than merely reproduce examples of utterances culled from a variety of sources. In this connection we shall also have to continue the quest for a really effective way of integrating remedial work in the course structure as a whole.

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77

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